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A STUDY OF INDOOR AIR QUALITY

William A. Cote, et al

Research Corporation of New England

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16. ABSTRACT

A study of indoor air quality was carried out over a 15-month period by TRC - The Research Corporation of New England. The program consisted of three tasks:

1. Laboratory investigations
2. Field studies
3. Inventory of indoor sources

Tasks 1 and 2 established the emissions and effect on air quality (NO_2, NO, and CO) of gas stoves and heaters both in the laboratory and in 4 homes with gas-fired stoves in the Hartford, Connecticut area.

Task 3 developed information on indoor sources of air contamination in typical southern New England homes and provided the basis for assessing the impact of aerosol products and their use on indoor air quality.

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ABSTRACT

This report describes the results of a three-phase study to investigate the indoor generation of air pollutants. Both field and laboratory measurements of nitrogen dioxide (NO_2), nitric oxide (NO), and carbon monoxide (CO) were made to evaluate the contribution of gas stoves to indoor pollutant levels. An inventory of significant sources of indoor air contaminants was also made.

In the field program, four private residences with gas stoves were selected for monitoring during the spring and fall of 1973. A two-week measurement period at each residence for each season was utilized. Measurements of the three pollutants were made at three indoor locations, the kitchen, living room and bedroom as well as outdoors.

In order to sample at all four locations simultaneously and yet conserve equipment and manpower, TRC designed and built a measurement system that enabled the use of a single analyzer for NO_2 and NO and a second analyzer for CO. An electronic timer, solenoid valves and continuously purged teflon sampling lines were used to permit the analysis of sample streams from each location in rapid sequence.

The laboratory program was designed to evaluate the mass emissions from both old and new stoves and also a small unvented space heater. The effectiveness of vented and unvented kitchen hoods in removing gaseous pollutants was also evaluated. A variety of stove operating modes were evaluated in order to establish a relationship between operating conditions and pollutant levels.

Two of the homes in the field program were surveyed to determine all significant indoor sources of contaminants. Information from these two in-depth surveys was used in surveying a broad range of TRC employees regarding contaminant generating activities.

The results of this program show the concentrations of NO_2, NO, and CO to which the occupants of residences are exposed, the variation of pollutant concentrations within a structure, the relative magnitude of indoor generated pollutants and outdoor pollutants which penetrate a structure, the influence of stove operations upon the generation of pollutant quantities, and the relative importance of contaminant sources other than gas appliances.

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INTRODUCTION

The Research Corporation of New England (TRC) carried out a study of indoor/outdoor air quality relationships for the forerunner of EPA, The National Air Pollution Control Administration (Contract CPA-22-69-14). The results of this study were published in the technical literature (1),(2) and showed that indoor air quality is a complex function of outdoor pollutant concentrations, building permeability, meteorological conditions, ventilation system design and indoor generation of pollutants. While more work is needed in establishing the specific effect of each of these factors on indoor air quality, the one factor of those listed which is least understood and which will assume greater importance as outdoor air quality improves, is indoor generation of air contaminants.

In 1972, a conference was held at South Berwick, Maine on the subject of improving indoor air quality.(3) The meeting brought together a wide range of scientists, engineers, and physicians concerned with the subject. The meeting showed the complexity and high degree of interest in the entire subject of indoor air quality. While indoor air quality in general appears to be dominated to a great degree by outdoor air pollution, the indoor/outdoor relationship is also a complex function of building permeability, type of ventilation system, meteorological conditions and internal generation. An especially important outcome of the meeting was the indication that internal generation of pollutants is a more critical aspect of the problem than was heretofore suspected. Gas stoves were implicated repeatedly as to their potential emissions of CO, hydrocarbons, NO_x, odorous materials and unspecified compounds that one doctor felt were responsible for adverse reactions on some of his highly sensitive patients.

---

(1) Yocom, J.E., W.L. Clink, and W.A. Coté, "Indoor/Outdoor Air Quality Relationships", APCA Journal, Vol. 21, 5, pp. 251-59, May 1971

(2) Yocom, J.E., W.A. Coté, W.L. Clink, "Measurement of Air Pollution Penetration into Building Interiors", Presented at 17th Annual ISA Analysis Instrumentation Symposium, April 19-21, Houston, Tex., published In the Proceedings: "Analysis Instrumentation", Vol. 9-ISA, Pittsburg, Pa.

(3) "Improving Indoor Air Quality", Engineering Foundation Conference Berwick Academy, South Berwick, Maine, August 13-18, 1972.

TRC's earlier indoor/outdoor work(1) for EPA demonstrated that unvented gas stoves can indeed contribute measurable quantities of CO to the indoor atmosphere and our sampling methods were able to track the travel of CO from this source to other parts of the house. However, the scope of this work did not include the measurement of other pollutants. The objective of the present EPA sponsored program is to investigate further the indoor generation of air pollutants in private residences. This effort has been organized into three major tasks as follows:

Task 1 - Laboratory Investigation

Task 2 - Field Studies

Task 3 - Inventory of Indoor Sources

This report summarizes the entire program. Following this general introduction, we present the Summary, Conclusions and Recommendations for the entire program. Then, in sequence, we present reports of each of the three tasks. Since these tasks represent discrete efforts within the overall program, we present them essentially as self-contained reports but with cross references to other tasks where appropriate.

---

(1) See page 1

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

SUMMARY

TRC has completed a 15-month research program on indoor air quality. The program was carried out in three tasks which are briefly summarized as follows:

1. Task 1 - Laboratory Study

   The objective of this task was to measure emmissions of NO, NO_2, and CO from normally used and operated gas stoves and unvented space heaters in relation to several stove and heater operating variables. Emissions from the gas appliances as well as emissions as modified by ventilating hoods were determined in a laboratory study. A brief survey of stove and heater designs was made to select representative models for testing. A completely enclosed laboratory structure was constructed for the evaluation of emissions from the appliance on a mass basis. Operating variables evaluated included air-fuel ratios, flame intensity, time and temperature and use of pilot lights.

2. Task 2 - Field Studies

   Measurements for NO_2, NO and CO were made continuously over 2-week periods in 4 homes with gas stoves in the Hartford, Connecticut area. Separate field measurement programs were carried out during the spring-summer of 1973 and fall-winter of 1973-1974.

   Sampling was carried out by means of a TRC-designed system which utilized single instruments to obtain data on a 5-minute sequential basis from four sampling points. Three of the sampling points were located indoors (one or two locations in the kitchen and either the living room or bedroom) while one monitored outdoor concentrations.

Data on stove use was recorded by the homeowner to permit comparisons of indoor air quality with stove use.

3. Task 3 - Inventory of Indoor Sources

A two-phase study to identify indoor sources was carried out. Initially, two of the houses used for the Task 2 effort were used as a basis for cataloging sources of potential indoor emissions. We determined that there are many sources of indoor air contamination which take many forms based on practices within each household.

One of the most widespread source categories within the home is the dispersal of household products in aerosol form. We carried out a survey of TRC employees to develop use patterns of aerosol products and to estimate the effect of such use on indoor air quality.

CONCLUSIONS

From the results of the work performed, we draw the following conclusions:

1. Combustion products from gas stoves degrade indoor air quality -- especially in terms of NO_2, NO, and CO. In several cases, levels of indoor NO_2 and CO could exceed the air quality standards for these pollutants if such outdoor standards were to be applied indoors.
2. Propellant dispersed aerosols also have a significant but widely variable impact on indoor air quality. While concentrations of propellants are estimated to be below the Threshold Limit Values (TLV's) for these materials, special circumstances may cause these levels to be exceeded on occasion.

3. The half-life of indoor concentrations of CO, an unreactive gas, was found to be 2.1 hr. NO is also relatively unreactive in the indoor atmosphere with a half-life of 1.8 hr. NO_2, on the other hand, showed a half-life in the same home of 0.6 hr. We conclude that NO_2 is lost through reaction, absorption and adsorption.

4. The ratios of NO_2 to NO produced by gas stoves varied somewhat, but there was some tendency to produce slightly more NO than NO_2.

5. Pilot lights on gas stoves produce a measureable amount of NO, NO_2, and CO during inactive stove use periods.

6. Outdoor air quality has a significant effect on indoor air quality, particularly in the warmer months when the house is relatively permeable.

7. Highest indoor concentrations of stove-generated pollutants occurred in the winter when the house was tightly closed.

8. Gas stoves and to a lesser extent unvented space heaters generate significant quantities of NO, NO_2, and CO as determined in our laboratory study. Some difference in emission levels were observed for older and newer stoves, but these are not directly attributable to age or design differences. Amounts of pollutants generated are directly related to the number of burners in operation and the amount of gas being consumed.

9. Vented stove hoods are moderately effective in removing gaseous pollutants but recirculating hoods are not effective.

RECOMMENDATIONS

The work performed has shown the need for further work in further defining indoor air quality, sources of indoor contamination, and the impact of indoor air quality on occupants of indoor spaces. We believe further work in the following areas is needed:

1. Further analysis and evaluation is needed of the data developed from this program. Task 2 of this program generated a large body of valuable data on the indoor/outdoor patterns of air quality in several different types of houses with gas stoves. While the data and their evaluation presented show clearly the magnitude of the influence of gas stoves on indoor air quality, further analysis of the data of the type listed below would put these evaluations in more precise perspective.
    a. Extrapolate the data obtained in this program to provide an estimate of total exposure to NO_2 and CO for the occupants of houses tested. This would involve the development of typical occupancy patterns for individuals and patterns of travel, activity and occupation together with outdoor ambient air quality data from this program and the State of Connecticut, and judgments based upon TRC's previous work and literature sources on what regimes of exposure could be expected for different occupations and within different types of enclosures.
    b. Utilize the existing data to develop preliminary models of the indoor concentrations in terms of indoor sources (stove use), design of house, relative permeability of the house, outdoor concentrations, and meteorological factors (temperature, wind direction and speed, etc.).
    c. Make a detailed analysis of indoor NO_2 and CO patterns in Houses 1, 3 and 4 to corroborate the shorter half life of NO_2 as opposed to CO as was determined in the diffusion experiment at House No. 2.

2. Further definition and quantification of indoor sources is needed. More detailed inventories together with well designed field measurement programs should be carried out. Highest priorities should be given to such common household activities as cleaning, smoking, cooking and use of aerosol products.
3. Epidemiological studies should be made of the possible effects on the occupants of homes of the wide range of materials present in the indoor air. These should be carried out simultaneously with programs to identify sources, likely contaminants, and field programs to measure indoor air quality.
4. In the diffusion studies, we determined that NO_2 from gas stoves disappears 3 times as fast as NO. Research should be carried out to determine what happens to NO_2. One possible route which has strong health implications is the formation of nitrate or nitrite aerosol in the highly humid kitchen atmosphere. A study to establish the ultimate disposition of NO_2 in the indoor atmosphere should be carried out.
5. The indoor/outdoor relationships for nitrate and sulfate aerosol and their precursors NO_x and SO_2 should be developed particularly in view of the formation of NO_2 and NO by gas appliances.
6. Air quality standards are based on outdoor concentrations, but epidemiological data supporting these standards undoubtedly include the integrated exposure to both indoor and outdoor air pollutants. Since people spend most of their time indoors, studies should be designed to establish true human exposure (both indoors and outdoors) to air pollutants.

7. Indoor/outdoor air quality studies need to be carried out on a broader base. There is a need for studies in different types of structures located in different types of communities. At the same time there is a need for carrying out such work in sufficient depth to permit statistical evaluation of the data, in order to verify the findings of initial surveys conducted to date.

8. Instrumentation is needed which can reliably operate on a continuous basis over longer periods of time to permit increased data recovery.

TASK 1

LABORATORY INVESTIGATIONS

1.0 INTRODUCTION

As part of The Research Corporation of New England's study of sources of indoor air pollution, Task 1 was planned to investigate emissions characteristics of gas appliances in a laboratory environment. Task 1 was developed in response to the lack of information available for pollutant emissions from gas appliances and their relationship to operating conditions.

TRC evaluated emissions from two gas stoves, an old and a new model, and an unvented space heater. Emission levels from the gas stoves were measured for the following types of operation:

1. pilot lights
2. burners
3. oven and broiler

The effects of flame intensity, air-fuel mixture, number of burners in use, and utensils were determined in this laboratory test program.

The oven and broiler emissions were evaluated under transient and steady-state operating conditions. In addition to these evaluations, we determined the effects of recirculating and vented hoods on the characteristics of pollutant emissions for gas stoves.

We measured nitric oxide (NO), nitrogen dioxide (NO_2), and carbon monoxide (CO) emissions from the gas appliances under the different operating conditions. These measurements were made with sequential sampling equipment in an enclosure built to isolate the appliances during the tests. We found through contact with the local gas utility that the sulfur content of the odorant in the natural gas was very low, 0.21 μg/kcal. Measurement of SO_2 with available monitoring equipment would not have yielded reliable results and therefore was not performed.

2.0 SUMMARY AND CONCLUSIONS

A brief summary of the results from Task 1 is presented in Table 2-1. Emission measurements are presented for an older and newer gas stove and an unvented space heater. For comparison, the emissions from a domestic gas furnace are also included in Table 2-1.

Pilot light NO and NO_2 emissions from the newer stove were less and CO emissions higher than those from the older stove. The newer stove also has a pilot light designed to use less gas than the older stove.

Tests designed to evaluate the effect of air-fuel mixture upon burner operation indicated that the best blue luminous flame was produced at an intermediate air shutter opening for each stove. Variation in the shutter opening had little effect on the pollutant emissions for the older stove but had a greater effect on the newer stove. The intermediate air shutter opening (best flame) also had the highest oxides of nitrogen levels for the newer stove.

Evaluation of the number of burners in use and their flame intensity showed that the emissions are similar for all conditions when adjusted to an equivalent heat input basis. Oven and broiler emissions are somewhat less than those for the burners on the same heat input basis. An exception was the large amount of CO from the oven of the newer stove.

Total pollutant emissions per unit of time from a gas stove are roughly proportional to the number and type of burners used and the period of use.

The unvented space heater had lower emissions than the stoves with the exception of NO at high flame and CO at low flame conditions.

Vented stove hoods could capture and exhaust about 40 to 50 percent of the pollutants generated by the stove depending upon the fan speed used. Our tests could not detect any removal of gaseous pollutants by a recirculating hood with a charcoal filter.

TABLE 2-1

SUMMARY OF POLLUTANT EMISSIONS OF GAS APPLIANCES FOR SEVERAL TYPICAL OPERATING CONDITIONS

Appliance	Operation	Heat Input Rate (Kcal/Hr)	Pollutant Emission Factors (μg/Kcal)			Pollutant Emission Rates mg/Hr		
			NO	NO_2	CO	NO	NO_2	CO
Older Gas Stove with cast Iron Burners	Pilot Lights	150	45.3	54.6	419	6.8	8.2	62.9
	1 Burner - High Flame	2700	92.6	51.8	382	250	140	1031
	3 Burners - High Flame	6780	117.0	72.8	475	793	494	3220
	Oven-Steady-state	2200	91.4	73.1	530	201	161	1166
Newer Gas Stove with Pressed steel burners	Pilot Lights	100	4.7	18.6	842	0.5	1.9	84.2
	1 Burner-High Flame	3500	130.0	79.0	510	455	277	1785
	3 Burners-High Flame	10200	138.0	65.6	315	1408	669	3213
	Oven-Steady-state	2200	77.9	50.4	1620	171	111	3564
Unvented Space Heater	Low Flame-Steady-state	2800	76.4	46.4	632	214	130	1770
	High Flame-Steady-state	6200	135.0	43.8	319	837	272	1978
Domestic Gas Furnace*	------	Approx. 30,000	NO_x@NO_2: 90.0		36	Approx. 2700		1080

* Compilation of Air Pollution Emission Factors (Revised), U.S. Environmental Protection Agency, February, 1972.

From the laboratory study, we conclude that:

1. Gas stoves emit significant quantities of oxides of nitrogen and carbon monoxides in the following ranges depending upon stove operation:

   NO = 90 - 130 μg/Kcal, 200-1000 mg/Hr
   NO_2 = 50 - 80 μg/Kcal, 100-500 mg/Hr
   CO = 400 - 1000 μg/Kcal, 1000-4000 mg/Hr

2. In our tests, pollutant emissions from the newer stove were not consistently higher or lower than the older stove for the range of operations evaluated. The oven of the newer stove did emit about three times more CO than the older stove oven.

3. The different designs of the burners for the two stoves did not appear to have consistent and reproducible effects upon pollutant emissions.

4. Pilot lights, although using gas at a small rate, do contribute quantities of pollutants comparable to those generated during cooking operations over a typical 24-hour period because of their continuous nature.

5. Vented stove hoods are moderately effective in removing gaseous pollutants but recirculating hoods are ineffective in removing pollutants.

6. An unvented space heater has pollutant emissions in the following ranges depending upon operation:

   NO = 80 - 130 μg/Kcal, 200-800 mg/Hr
   NO_2 = 40 - 50 μg/Kcal, 100-300 mg/Hr
   CO = 300 - 600 μg/Kcal, 1000-2000 mg/Hr

   These emissions are less than that for a gas stove, however, total emissions could be greater if the heater were used continuously.

3.0 DESCRIPTIONS AND PROCEDURES

3.1 Appliance Selection

A preliminary survey was conducted to determine the different types of stoves, hoods, & space heaters available for residential use. Design features that could possibly affect pollutant emissions fall into two major categories, heat input rate and burner construction. Maximum heat input rates for range top burners are split evenly between 2300 Kcal/hr and 3000 Kcal/Hr. Oven and broiler heat input rates vary from 3000 Kcal/hr to 6300 Kcal/hr. Burner construction is divided into four major categories:

1. Steel tube (venturi) with ports or slots
2. Infrared type
3. Cast iron with drilled ports
4. Pressed steel with formed ports

The latter two are predominant with most modern gas stoves having the pressed steel burners and older stoves the cast iron burners. We chose one stove from each of these latter two categories for the laboratory study.

Space heaters, not in general use in the Northeast, are available in several different configurations. They have single or multi-port cast iron burners and are vented to either the living space or outdoors. The heating medium is either hot air, steam or hot water. The Project Officer supplied us with a multi-ported, unvented, hot air space heater for the task.

Range top hoods are available in many different sizes and either recirculate indoor air or exhaust to the outside. For this study, we selected a representative hood for each category, one recirculating and one vented. Table 3-1 summarizes the characteristics of the applicances selected for this test program.

TABLE 3-1

CHARACTERISTICS OF THE GAS APPLIANCES AND HOODS

Appliance	Age	Description	Nominal Rated Capacity	
New Gas Stove	5 Years	4 pressed steel burners, 3 pilot lights	Burners: Each: 3000 Kcal/Hr	Oven/Broiler 5500 Kcal/Hr
Old Gas Stove	Approx. 20 Years	4 cast iron burners, 3 pilot lights	Burners: Each Small: 2550 Kcal/Hr Large: 3000 Kcal/Hr	Oven/Broiler 3550 Kcal/Hr
Unvented Space Heater	Approx. 15 Years	Cast iron multi-port burner, hot air, manual ignition	6700 Kcal/Hr	
Recirculating Hood	New	2 speed fan 930 CM^2 Inlet Area	Rated Fan Capacity 4.2 M^3/MIN	
Vented Hood	New	3 speed fan 1677 CM^2 Inlet Area	8.4 M^3/MIN	

3.1.1 Newer Gas Stove

This five year old gas stove was purchased used and has four pressed steel burners. Each burner is rated at 3000 Kcal/hr. There are two pilot lights for the burners and broiler. The oven, with a capacity of 5500 Kcal/hr, has its own pilot light and has a volume of approximately 98,300 CM^3. It was chosen as representative of one of the two major types of gas stoves available and in common use. Air-to-fuel ratios are controlled at each of the burners by shutters.

3.1.2 Older Gas Stove

This stove is approximately twenty years old and has four cast iron burners with two pilot lights. Another pilot light is located near the oven and broiler. The broiler and over are separate compartments of 23,600 CM^3 and 65,600 CM^3, respectively. This appliance represents the second major category of gas stove in use in residential structures. There are two small burners and two larger ones having individual rated capacities of 2550 and 3000 Kcal/hr, respectively. The oven has a 3550 Kcal/hr capacity.

3.1.3 Recirculating-Type Range Hood

This hood, which is the most commonly used in modern residences, has a two-speed fan that draws a maximum of 4.2 cu.m/min. Air from above the stove passes through a 930 square centimeter aluminum grease filter and activated charcoal unit. The exhaust from this hood is discharged directly into the kitchen space.

3.1.4 Vented Range Hood

This second type of hood made by the same manufacturer as the recirculating type used in this study has a greater exhaust capacity. The three-speed fan draws a maximum of 8.4 cu.m/min through a 1677 cm^2 aluminum grease filter and exhausts this air through a .15 meter diameter sheet metal duct to the outside.

3.1.5 Space Heater

The space heater which was supplied by the Project Officer, was an unvented hot air system with a multi-port cast iron burner. This fifteen-year old space heater has neither a pilot light nor an air-fuel adjustment device. Combustion air was provided to the 12 finned burners by aspiration. It has a maximum heat input of 6700 Kcal/hr.

3.2 Procedures

3.2.1 Laboratory Test Enclosure

Figure 3-1 shows the laboratory test enclosure and sampling system built specifically for this study. The test enclosure was designed and built to isolate the stoves, hoods and space heater from external influences and to allow us to monitor the generation of pollutants in a convenient manner.

The test room enclosed 8.0 cubic meters, 2.4 meters long and 1.4 meters wide, and was 2.4 meters high. One door and two sealed windows were installed to allow access to and observation of the stoves in the test chamber. The sheet rock walls were covered with a non-adsorbent epoxy base paint and all openings were sealed with silicone weatherstripping. The air intake for the test enclosure was a .2 meter diameter duct. Control of the intake air was achieved by a variable guillotine damper placed in the inlet duct.

Ventilation of the test enclosure was provided with a 8.4 m^3/Min fan placed in the .2 meter room outlet duct in the ceiling.

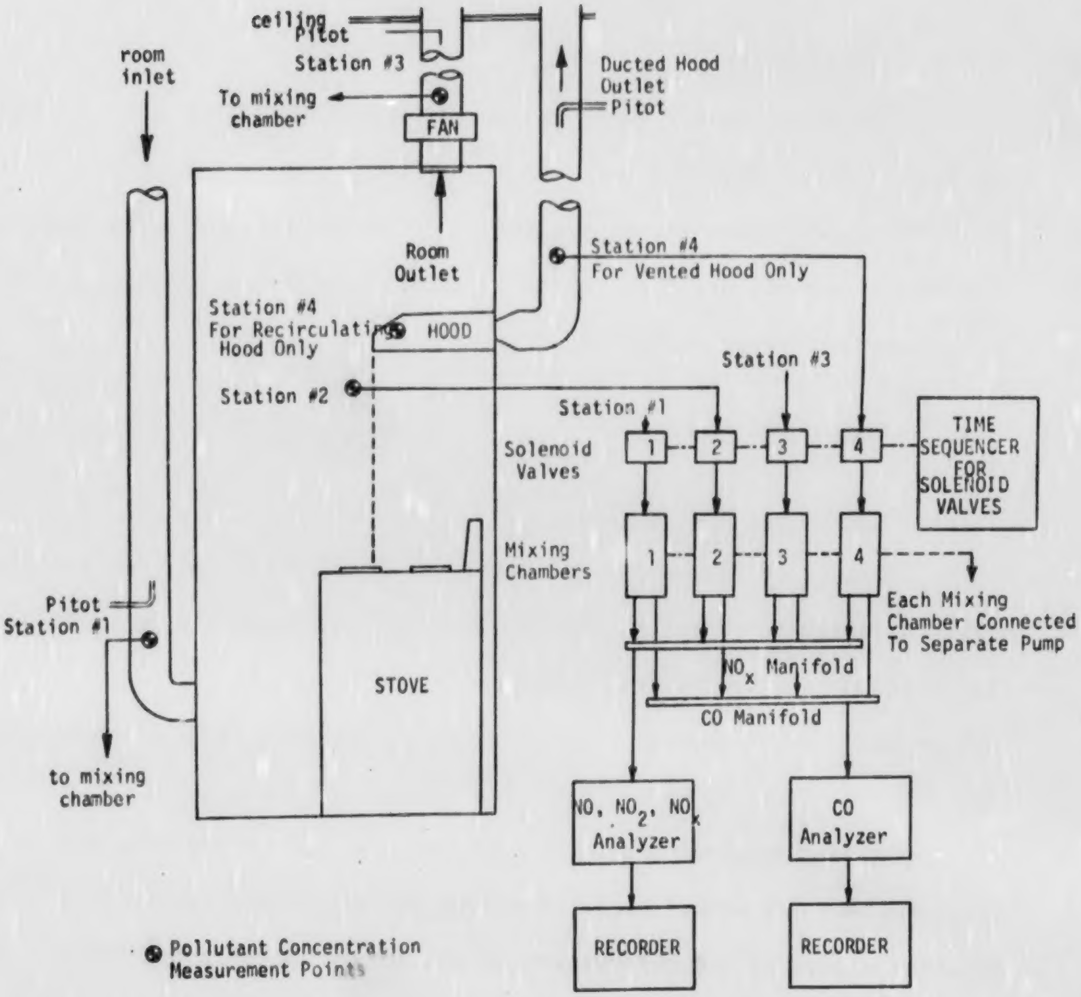

ceiling
Pitot
Station #3
room
inlet
To mixing
chamber
FAN
Ducted Hood
Outlet
Pitot
Room
Outlet
Station #4
For Vented Hood Only
Station #4
For Recirculating
Hood Only
HOOD
Station #2
Station #3
Station #1
Solenoid
Valves
1
2
3
4
TIME
SEQUENCER
FOR
SOLENOID
VALVES
Mixing
Chambers
1
2
3
4
Each Mixing
Chamber Connected
To Separate Pump
Pitot
Station #1
STOVE
NOx Manifold
CO Manifold
to mixing
chamber
NO, NO2, NOx
Analyzer
CO
Analyzer
RECORDER
RECORDER
Pollutant Concentration
Measurement Points

Figure 3-1: Testing Room and Equipment Arrangement

A .15 meter diameter exhaust outlet for the vented hood was placed in the back wall of the test enclosure. Air flow through the inlet and outlet was measured by standard type pitot tubes and inclined manometers.

3.2.2 Measurement System

In order to measure pollutant concentrations at multiple locations and yet conserve the amount of instrumentation and manpower required to obtain this data, TRC designed and built a unique measurement system as shown in Figure 3-2. The major components of the system are four continuously purged sampling lines with an integrating chamber, solenoid valves, Bendix Chemiluminescent NO/NO_x Analyzer, Intertech Non-Dispersive Infrared Carbon Monoxide Analyzer, carbon monoxide and NO/NO_2 Calibration Systems, strip chart recorders and electronic sequencer. The system design acknowledged the need for:

1. Continuous, uninterrupted operation with only periodic service
2. Frequent automatic and manual calibration checks.

As shown schematically in Figure 3-2, the sample stream from each of the four locations is piped to a central location through 15 meters of 4.8 mm I.D. Teflon tubing at a rate of approximately 9.5 LPM. This is equivalent to a retention time of approximately 2 seconds. Each sample stream is then drawn through an individual 500 ml glass integrating chamber, through a diaphram pump and then vented. This arrangement provides continuous purging of the sampling lines.

From the integrating chamber two small streams are drawn, one to the Bendix Chemiluminescent NO/NO_x analyzer and the other to the Intertech NDIR CO analyzer. Solenoid valves (normally closed) on each sample line are energized by the electronic sequencer at five minute intervals with

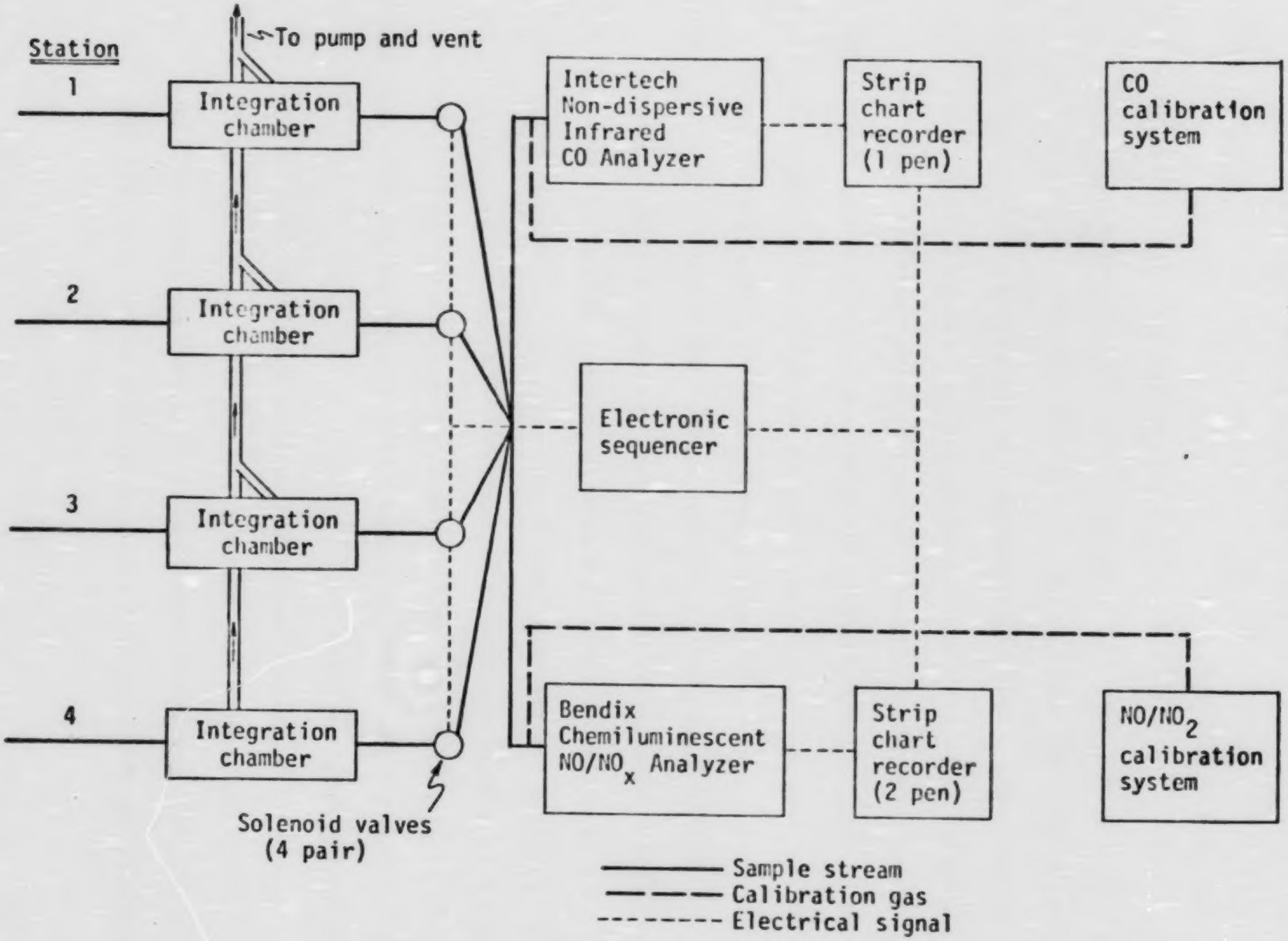

Station
1
2
3
4
To pump and vent
Integration chamber
Integration chamber
Integration chamber
Integration chamber
Solenoid valves (4 pair)
Intertech Non-dispersive Infrared CO Analyzer
Strip chart recorder (1 pen)
CO calibration system
Electronic sequencer
Bendix Chemiluminescent NO/NO$_x$ Analyzer
Strip chart recorder (2 pen)
NO/NO$_2$ calibration system
Sample stream
Calibration gas
Electrical signal

FIGURE 3-2

NO, NO$_2$, and CO Sampling and Measurement System each station having its sample being drawn to the detectors once every twenty minutes. The two solenoid valves that allow samples to be drawn to the CO analyzer and the NO/NO_2 detector from the integration chamber are kept in phase so that the sample stream from each station is being analyzed simultaneously for CO and NO/NO_2. A two pen recorder was used for the NO and NO_2 output of the chemiluminescent analyzer and a separate single pen unit for recording the CO output.

An additional function of the electronic sequencer was to mark the beginning of each 20-minute sampling cycle. This was accomplished by creating a vertical slash on each strip chart immediately before the analysis of the Station 1 sample stream for the three pollutants of interest. This sampling and measurement system is the same as the one used for the Task 2 field measurements.

3.2.3 Calibration Procedures

Calibration of the Bendix Chemiluminescent NO/NO_2 Analyzer was accomplished with a dynamic dilution module. This module was provided by the Environmental Protection Agency and is described schematically in Figure 3-3. A wide range of concentrations of NO and NO_2 can be generated by this unit for calibrating the NO/NO_2 analyzer. Bottled NO calibration gas with a guaranteed concentration of 95.1 ppm and purified room air were used to produce the various nitric oxide concentrations. Nitrogen dioxide can be produced in different concentrations by the use of the ozone generator that is part of the calibration module.

The procedures used to calibrate the Bendix Chemiluminescent NO/NO_2 Analyzer were provided by the EPA and are identical to those used in Task 2. A copy of the procedures can be found in Appendix A.

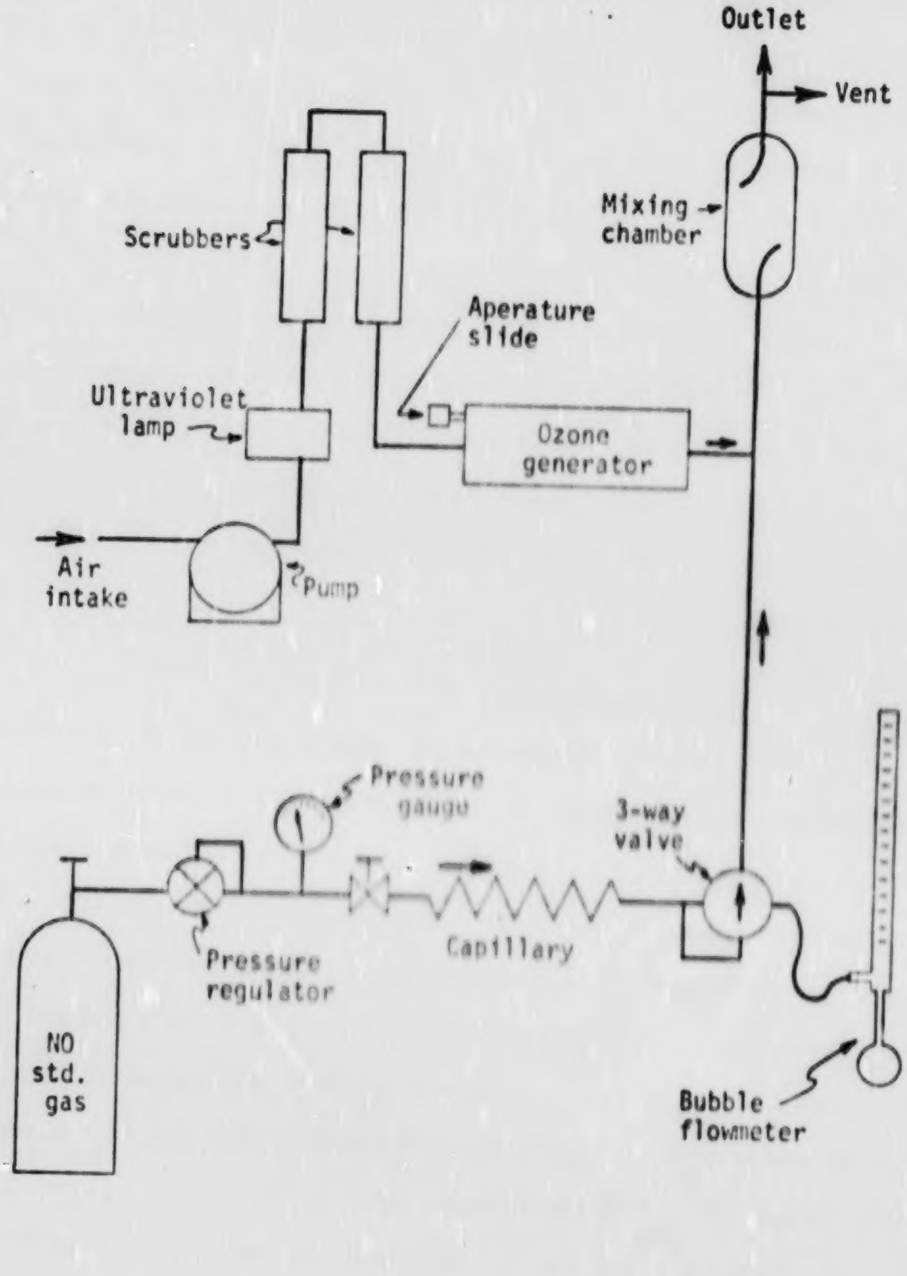

Outlet
Vent
Mixing chamber
Scrubbers
Aperature slide
Ultraviolet lamp
Ozone generator
Air intake
Pump
Pressure gauge
3-way valve
Pressure regulator
Capillary
NO std. gas
Bubble flowmeter

FIGURE 3-3

NO - NO_2 Calibration System

The calibration of the non-dispersive infrared (NDIR) carbon monoxide analyzer was accomplished with zero gas and 13.0 ppm (14,950 $\mu g/m^3$) CO calibration gas. Zero gas was introduced into the detector cell to establish the zero baseline of the device. Calibration gas was then used to determine the span, or chart displacement, of a known concentration of carbon monoxide. Finally, the zero gas was re-introduced to ensure the baseline stability.

3.2.4 Sampling Locations

To determine the generation and behavior of the pollutants from the gas appliances with and without the hoods in operation, we chose the four sampling locations within the test structure as follows:

Station 1: Test enclosure air inlet

Station 2: Above the gas appliance - approximately 1.7 meters above the floor

Station 3: Test enclosure air outlet directly downstream of the sealed fan unit.

Station 4: Recirculating hood outlet or in outlet duct from vented hood.

Station 1 pollutant measurements were used to establish the baseline, or background, levels in the air entering the test structure during the experiments. Initial comparisons of measured inlet and outlet air volumes showed the presence of sufficient leakage, 10% to 50%, to disallow the conversion of the inlet concentrations to a mass basis. The concentration of the air entering the structure through all openings was assumed to have a pollutant concentration as measured in the inlet duct.

Station 2 was placed in the breathing zone directly above the stove. This location was chosen to provide data that would be representative of concentrations encountered by the person using the gas appliance and to monitor the presence of steady-state concentrations within the enclosure.

Room outlet pollutant concentrations were measured at Station 3 in the test enclosure outlet duct. Air flow measurements taken at Station 3 were used with the Station 1 inlet pollutant concentrations to determine the mass input rate of pollutants into the test structure. The pollutant concentrations at this outlet were converted to a mass basis by the use of these air flow data as well.

Station 4, depending upon the individual test, was placed in either the recirculating hood outlet or in the outlet duct from the vented hood. When neither hood was in use, this station remained inoperative.

Test personnel monitored pollutant concentrations at all four locations throughout each test sequence. Our reported results were taken from reproducible, steady-state conditions except when transient conditions were under study. The steady-state condition was achieved when pollutant levels at Station 2, above the gas appliance, stopped fluctuating. In most cases, duplicate tests were run to verify the initial tests.

3.3 Test Plan

A comprehensive test plan was prepared to guide the measurement personnel in performing the laboratory tests in rapid sequence. The plan was designed to assess the emission quantities produced by gas stoves, space heaters and the pollutant removal capability of vented and unvented hoods. The tests designed for these objectives are discussed in the next three sections.

3.3.1 Gas Stoves

The generation and behavior of pollutants from gas stoves is a function of many inter-related variables including burner and oven size and design, pilot lights, air-fuel mixture, flame intensity, etc. To have a test plan of manageable size to give us meaningful results we divided these effects into the following categories:

1. pilot lights
2. air-fuel mixtures
3. burner size
4. flame intensity
5. combinations of burner use
6. broiler
7. oven
8. utensils

Each of these variables was individually isolated for testing with each of the two stoves and determined in the sequence listed above.

Pilot Lights- With most modern stoves having continuous rather than manual pilot lights, we decided that this aspect of the stove's impact on indoor air quality deserved investigation. It was relatively easy to seal each stove in the test enclosure and monitor the pollutant emissions of the pilot lights.

Burner Air-Fuel Mixture- The first series of tests on each stove was designed to give comparative data for each stove showing the effects of different air-fuel mixtures on pollutant emissions. On the older stove with two sizes of burners, we tested the larger one which was comparable to those on the newer stove. A high flame intensity was used for these tests on one burner on each stove.

Changes in the air-fuel mixture were made by adjusting the primary air-shutter under each burner. Three air-shutter adjustments were tested: maximum primary air, intermediate and minimum primary air. The intermediate air-shutter setting was judged as the position which created the best luminous blue flame, considered as the most efficient operating condition. This setting was used for all the subsequent tests.

Burner Size- Since the newer stove had four equal size burners, this test series was run on the older stove with 2 small and 2 large burners. Separate tests were run with each size burner set at a high flame intensity. The data were used to evaluate what effects of pollutant emissions could be attributed to the different size burners.

Burner Flame Intensity- Two extremes of flame intensity, high and low, were chosen for this test series on the newer stove. Each flame intensity was tested separately to compare the effects of these two operating conditions on pollutant generation.

Combination of Burner Use- This test series was designed to determine the buildup of pollutant emissions with the successive ignition of each burner at 15 minute intervals. Each stove was tested at low flame and at high flame intensity. The newer stove had one burner with a temperature sensor that shuts off the flame when the preset temperature is reached. This burner was the last one ignited in the test sequence so that any possible disturbance in pollutant emissions by the modulating flame could be avoided.

Broiler- The broiler in each stove was tested under two different operating conditions, transient and steady-state. We monitored the pollutant emissions during the transient phase as the broiler heated up to its thermostat setting, 500°F. When the broiler reached this temperature, the steady-state tests were run. These two operating conditions were re-tested with one burner in operation at a high flame.

Oven- Our spring-summer phase of the Task 2 field measurements showed the oven and broiler as significant sources of NO_2, NO and CO. As far as we could tell, these emissions were greatest during the oven warm-up period.

To investigate these findings in a laboratory situation we tested each stove under two conditions, transient and steady-state. The transient condition was represented by the oven's warming up to the thermostat setting, 475°F(245°C). The steady-state tests were run after the oven reached and maintained the preset temperature. This series of tests at the two operation conditions was repeated with the addition of one burner set on high flame.

Utensils- We chose several representative types of utensils for testing on one burner of each stove. Pollutant concentrations were determined separately for aluminum, cast iron, stainless steel, and Pyrex utensils. The flame settings, low and high, remained unchanged until the effect of each utensil had been measured. Another test for comparative purposes was run at the same flame setting with no utensil on the burner. This test with no utensil was used as a baseline to compare the relative effects of each utensil. Water was placed in each utensil and brought to a boil during each test.

3.3.2 Hoods

A comparison of the unvented and vented hoods was made from tests with a combination of burners and the oven in use on the newer stove. These tests were run to determine the respective pollutant removal efficiencies, if any, for each hood. Tests were also run with the fan on the vented hood operating at two different speeds to determine the effect of exhaust rate on removal efficiencies.

3.3.3 Space Heater

The unvented space heater is a fairly uncomplicated appliance and in contrast to the gas stoves there are few operating conditions that could be investigated. Our tests were conducted under two operating conditions, transient and steady-state for a low and high heat input. Pollutant emission levels were measured for each of these four conditions.

3.4 Calculations

The pollutant emissions from the gas appliances were determined from comparisons of the data collected at each of the four sampling locations within the test enclosure. The contribution of the gas appliance was calculated as the difference between the mass emissions at the outlet, Station 3, and the mass rate of pollutants entering the test enclosure. The concentration of pollutants in the room inlet air was measured at Station 1 and the mass inlet rate was then calculated with air flow data from Station 3. Using the Station 3 air flow data took into account any leakage that would not be detected at the Station 1 room inlet.

For the tests with the vented hood in operation, the total air flow and pollutant concentration were determined as the sum of the emissions through the room outlet duct, Station 4 and the hood outlet duct, Station 3. From this sum, the pollutant mass rate entering the test enclosure was subtracted to obtain the mass emission rate of the gas stove.

Pollutant emission levels from the stove on a heat input basis were calculated from the mass emission rates and gas usage data taken from an integrating meter installed in the natural gas supply line.

The effect of various utensils was determined by a simple measurement scheme utilizing the concentration of pollutants measured directly over the stove adjusted for any change in the incoming room air pollutant concentrations. Concentration measurements were judged more sensitive for measurement of small differences which may not have to be uncovered using the above mass emission calculation procedure.

4.0 RESULTS AND DISCUSSION

The pollutant emission levels for the gas appliances were calculated from the concentrations measured at Stations 1 and 3, the room inlet and outlet, respectively. The difference between the inlet and outlet mass rates of pollutant are attributable to the effect of the stove.

The emission results shown in Tables 4-1 to 4-6, with the exception of Table 4-3, are presented on a heat input basis, micrograms per kilocalorie, μg/Kcal and also on a per unit time basis, mg/Hr. Results on both bases are shown to provide an emission factor independent of the amount of fuel used and an emission rate for a particular set of conditions. Table 4-3 shows the pollutant concentrations above the stove as a measure of the effect of utensils on pollutant generation.

4.1 Gas Stoves

The gas stove provided the greatest variety of operating situations that could affect the generation of pollutants. The effects of pilot lights, burners, oven, broiler and utensils were evaluated. For the burners, additional characteristics including air-fuel mixture, size, flame intensity, and number in use were evaluated for their effect on pollutant emissions.

4.1.1 Pilot Lights

The results for the pilot light tests on the two stoves are presented in Table 4-1. Some significant differences in pilot light pollutant emissions levels are apparent in these data. Both of these appliances have three pilot lights yet gas consumption for those in the older stove was 50% higher than for the newer stove. Carbon monoxide emissions for the newer stove were approximately twice as high as from the older one. Oxides of nitrogen emissions were substantially lower from the pilot lights of the newer stove.

The pilot lights on newer gas stoves are designed to consume less gas than those on older stoves. This design change is confirmed by our natural gas input measurements taken during the pilot light tests.

TABLE 4-1

POLLUTANT EMISSION LEVELS FOR THE PILOT LIGHTS AND DIFFERENT BURNER OPERATING CONDITIONS

Test	Operating Condition	Stove	Natural Gas Input Rate (Kcal/Hr)	Pollutant Emission Factors (μg/Kcal)			Pollutant Emission Rates (mg/Hr)		
				NO	NO_2	CO	NO	NO_2	CO
	Pilot Lights:								
1		New	100	4.65	18.6	842	0.5	1.9	84.2
2		Old	150	45.3	54.6	419	6.8	8.2	62.9
	Air-Fuel Mixture:								
3A	Maximum Primary Air	New	3500	78.6	120	461	275	420	1614
3B	Intermediate Primary Air	New	3500	117	71.7	794	410	251	2779
3C	Minimum Primary Air	New	3500	119	112	419	417	392	1467
	Air-Fuel Mixture:								
4A	Maximum Primary Air	Old	2700	98.7	55.9	416	266	151	1123
4B	Intermediate Primary Air	Old	2700	99.7	55.4	413	269	150	1115
4C	Minimum Primary Air	Old	2800	93.8	54.1	354	263	151	991
	Burner Size:	Old							
5	Small		2400	85.9	53.1	376	206	127	902
6	Large		2700	92.6	51.8	382	250	140	1031
	Flame Intensity:	New							
7A	Low		1700	140	76.0	346	238	129	588
7B	High		3500	130	79.0	510	455	277	1785
	Ignition Sequence:								
	Low Flame	New							
8A	1 Burner		1200	42.2	59.2	280	51	71	336
	2 Burners		2400	106	67.7	221	254	162	530
	3 Burners		3600	75.0	66.7	291	270	240	1048
	4 Burners		4800	76.2	93.1	486	366	447	2333
	High Flame	New							
8B	1 Burner		3400	109	55.8	832	371	190	2829
	2 Burners		6800	137	57.3	405	932	390	2754
	3 Burners		10200	138	65.6	315	1408	669	3213
	4 Burners		13600	96.3	55.2	274	1310	751	3726
	Low Flame	Old							
9A	1 Burner		500	36.3	99.8	1540	18	50	770
	2 Burners		1000	40.8	95.4	2130	41	95	2130
	3 Burners		1500	51.5	84.8	1420	77	127	2130
	4 Burners		2000	47.7	84.0	1430	95	168	2860
	High Flame	Old							
9B	1 Burner		2260	102	57.1	554	231	129	1252
	2 Burners		4520	111	77.6	672	502	351	3037
	3 Burners		6780	117	72.8	475	793	494	3230
	4 Burners		9040	100	70.4	461	904	636	4167

Ambient background NO, NO_2, and CO levels in the test enclosure of 26, 50, and 2490$\mu g/m^3$, respectively, were comparable to those encountered in the field sampling program during inactive periods, such as late night and early morning. It is during this time period that measured pollutant levels reflect only the pilot light emissions. The difference in pollutant emissions from the pilot lights is undoubtedly due to a combination of factors including stove age, condition, and design.

4.1.2 Burner Primary Air-to-Fuel Mixture Effects

One of the most fundamental factors of burner operation that can be modified is the air-fuel mixture. Changing the air-fuel mixture by adjusting the air shutter under the burner would expectedly alter the combustion characteristics and subsequently affect pollutant generation. One burner on each stove was used for this test series. The burner was set at high flame and its air shutter was adjusted to three positions; full open, full closed, and intermediate. The intermediate air shutter setting was judged as the position which created the best luminous blue flame, considered as the most efficient operating condition.

At the intermediate air shutter setting the emission levels from the newer stove were noticeably higher than those from the older unit as shown in Table 4-1. Increasing the primary air to a maximum for the newer stove caused a 33% and 42% reduction in NO and CO levels while NO_2 levels increased by 67%. Reducing the primary air in the burner of the older stove caused a slight decrease in the pollutant emissions. The minimum air setting on the newer stove affected NO emissions only slightly while the CO decreased and the NO_2 increased as compared to the intermediate shutter setting values.

Generally, these data show that the emissions from the older stove are less sensitive and more uniformly independent of the air-fuel mixture.

Emissions from the newer stove are noticeably higher at the optimum air shutter setting.

4.1.3 Burner Size Effects

Since the newer stove had four burners of equal size, we ran these tests on the older stove only. The small and large burners were tested separately at high flame intensity. The pollutant emissions data presented in Table 4-1 show the burner size has little effect when compared on a heat input basis.

4.1.4 Burner Flame Intensity Effects

TRC investigated pollutant emissions at two flame intensities, high and low, on one burner of the newer stove. The high flame had a heat input more than twice that used for the lower flame. As shown in the results presented in Table 4-1, emission factors for NO, NO_2, and CO during these two different conditions of burner operation are closely correspondent. The greatest difference in emissions is apparent for the carbon monoxide with the high flame having a 50% higher CO emission factor than the low flame. Total emission rates per unit time increase in proportion to the amount of fuel used.

4.1.5 Burner Ignition Sequence Effects

For this series of tests, each burner was ignited successively at 15-minute intervals. The build up of pollutant emission levels was monitored for a 60-minute period, until 15 minutes after the fourth burner was ignited.

At each flame intensity, nitric oxide and NO_2 emission factors were relatively constant with a few exceptions for each stove, regardless of the number of burners in use, when adjusted to a heat input basis.

Carbon monoxide emission factors seem to be affected the most by increased number of burners in use. The burners of the older stove generated more NO_2 and CO per unit of heat input than those of the newer one, especially during the low flame tests. In these low flame tests, nitric oxide emission factors for the newer stove burners were noticeably higher than those from the older stove. These differences are less apparent for the high flame tests.

Pollutant emission quantities per unit time were less for the older stove than the newer stove except for carbon monoxide, particularly when a low flame was used. The difference in emission quantities between stoves was due to the smaller fuel consumption rate of the older stove at a specified setting. In spite of this smaller fuel consumption rate, the carbon monoxide emissions for the older stove were greater than the newer stove.

4.1.6 Broiler and Oven

For the tests on each stove's broiler and oven, we chose two operating conditions for investigation defined as transient and steady-state. The transient condition included the period from oven or broiler ignition until the temperature reached 475°F (245°C) for the oven and 500°F (260°C) for the broiler. For the steady-state mode, we then operated the oven and broiler at the above settings for a similar time period during which the oven or broiler flame would cycle on and off to maintain the desired temperature. The thermostat for the older stove did not work properly and consequently, the flame remained on even after the desired temperature was reached.

The results for this test series are shown in Table 4-2. For both stoves, pollutants are generated at a generally higher rate per amount of heat input while operating in the transient condition as compared to steady-state. The broilers of both stoves have comparable emission levels except the NO from the newer broiler is 50% higher than the older one during a steady-state operation. The newer oven generates more carbon monoxide but less oxides of nitrogen than the older oven at steady-state.

TABLE 4-2

POLLUTANT EMISSION LEVELS FOR
BROILER AND OVEN OF TWO GAS STOVES

Test	Operating Condition	Stove	Natural Gas Input Rate (Kcal/Hr)	Pollutant Emission Factors (μg/Kcal)			Pollutant Emission Rates, mg/Hr		
				NO	NO_2	CO	NO	NO_2	CO
10A	Broiler: Transient Steady-state	New	4900 3700	126. 136.	80.6 57.1	846 757	617 503	395 211	4145 2800
12A	Broiler: Transient Steady-state	Old	3000 3800	137. 88.8	123. 48.5	1350 818	411 337	369 184	4050 3108
14A 14B	Oven: Transient Steady-state	New	4000 2200	331. 77.9	79.0 50.4	1010 1620	1324 171	316 111	4040 3564
16A 16B	Oven: Transient Steady-state	Old	2300 2200	157. 91.4	159. 73.1	1790 530	361 201	366 161	4117 1166

Comparing the oven and broiler emissions with the burner emissions in Table 4-1 shows that based upon equivalent heat input, the oven and broiler generally produce less oxides of nitrogen and more carbon monoxide than the burners. However, the quantity of pollutants per unit time is greater for the oven and broiler than the burners because of the greater fuel consumption of the former during normal operation.

4.1.7 Utensil Effects

Table 4-3 shows the results of our pollutant concentration measurements with different utensils on one burner of the new stove under two flame intensities, high and low. The cast iron and the stainless steel utensils show the ability to reduce NO_2 to NO in the low flame test condition, although the relative change is not significant. The most substantial utensil effect apparent is the much higher CO concentrations for the aluminum pot test. Each utensil shows the effect of decreasing NO_2 concentrations when compared to the test done without utensils.

Behavior of each utensil in affecting pollutant concentrations during the high flame tests was different from the low flame tests. Nitric oxide and NO_2 concentrations were generally higher with a utensil on the burner than without one. Except for the stainless steel utensil, carbon monoxide levels were lower with the use of each utensil.

The magnitude of the observed effects of utensils upon pollutant concentrations, although measurable, does not appear substantial. No one utensil has a substantial effect upon pollutant measurements.

4.2 Hoods

Table 4-4 shows the results of our tests on the vented hood's efficiency in removing pollutants from the test enclosure. These data show that the vented hood is moderately effective in removing pollutants from the room. The higher

TABLE 4-3

POLLUTANT CONCENTRATIONS (1)
RELATED TO VARIOUS UTENSILS

Test	Operation Condition	Utensil	Stove	Pollutant Concentrations, $\mu g/m^3$		
				NO	NO_2	CO
	Low Flame:		New			
18A		Aluminum		27	58	1066
18B		Cast Iron		32	66	545
18C		Stainless Steel		32	72	403
18D		Pyrex		27	76	474
18E		None		27	82	675
	High Flame:		New			
19A		Aluminum		260	204	1910
19B		Cast Iron		221	224	1433
19C		Stainless Steel		207	224	2380
19D		Pyrex		233	224	2030
19E		None		207	183	2030

(1) The effect of utensils on pollutant generation was determined by measurement of pollutant concentrations directly above the stove rather than by calculation of pollutant quantities entering and leaving the laboratory enclosure.

TABLE 4-4

POLLUTANT REMOVAL EFFICIENCIES FOR NEWER GAS STOVE WITH VENTED HOOD

Test	Operation	Hood Fan Speed	Natural Gas Heat Input Rate Kcal/ hr	Pollutant	Pollutant Emission Rate, mg/hr.		Hood Removal Efficiency %
					Without Vented Hood	With Vented Hood	
21A	Oven and 4 Burners	Medium	14,200	NO	1,968	1,161	41
				NO_2	1,377	826	40
				CO	12,354	7,536	39
21B	Oven and 4 Burners	High	14,200	NO	1,785	910	49
				NO_2	1,332	719	46
				CO	11,076	5,649	49
22	Oven and 4 Burners	Off	14,400	NO	2,193	2,105	4
				NO_2	1,221	1,160	5
				CO	10,140	9,430	7

fan speed, with its greater induced draft above the stove, will capture and exhaust about 50% of the pollutants generated by the stove. With the fan shut off, there is enough draft to allow measurable amounts of pollutants to escape through the hood outlet duct.

Table 4-5 presents the results of tests to determine the ability of the charcoal filter in the recirculating hood to remove gaseous pollutants. Two separate tests were run, one with the ducted hood without a filter and one with the recirculating hood with the charcoal filters. In both cases, the newer stove was used. Comparison of the data from both tests shows in our judgment no collection efficiency for the charcoal. While these is a difference of about 10% in the NO_2 and CO measurements between tests, we estimate this to be measurement error. From comparison of other data taken during the test program, the mass balance approach we have used to determine emissions has an accuracy of ±10% which is reasonable for the objectives of this task. A more precise evaluation of a charcoal filter would have to be determined by a different laboratory method which was beyond the scope of this task.

4.3 Unvented Space Heater

Table 4-6 shows the results of our tests on the unvented space heater. The uncomplicated nature of this appliance left us with relatively few operating conditions to evaluate. We chose two operating conditions, transient and steady-state for the emission measurement tests.

Our measurements show that the pollutant emissions are relatively higher during steady-state operation of the space heater at the preset temperature. This is opposite to our findings for the gas stove oven and broiler tests.

TABLE 4-5

POLLUTANT REMOVAL EFFICIENCIES FOR NEWER GAS STOVE WITH RECIRCULATING HOOD

Tests	Operation	Hood Fan Speed	Natural Gas Heat Input Rate Kcal/Hr	Room Outlet Emissions, mg/hr		Recirculating Hood Removal Efficiencies, %
				without charcoal filter	with charcoal filter	
8B and 20B	High Flame Four Burners	Medium	13,600	NO: 1290 NO_2: 671 CO: 4060	1310 751 3726	0 (-10) 10

TABLE 4-6

POLLUTANT EMISSION LEVELS
OF THE UNVENTED SPACE HEATER

Test	Operating Condition	Natural Gas Input Kcal/Hr	Pollutant Emission Factors, μg/Kcal			Pollutant Emission Rates, mg/Hr		
			NO	NO_2	CO	NO	NO_2	CO
	Low Flame:							
25	Transient	1280	6.6	14.1	414	8	18	530
26	Steady-state	2800	76.4	46.4	632	214	130	1770
	High Flame:							
27	Transient	6600	84.2	19.0	133	556	125	878
28	Steady-state	6200	135.	43.8	319	837	272	1978

We also see that the high flame operating condition as having greater emissions than the low flame condition. In general, our tests show pollutant emissions as somewhat lower than those from the gas stoves when adjusted to a heat input basis. However, using the space heater continuously would add a considerable amount of pollutants to the indoor atmosphere when compared to the intermittent operation of gas stoves.

TASK 2

FIELD STUDIES

1.0 INTRODUCTION

The purpose of this task is to determine the impact of gas stove emissions and outdoor air quality on indoor air quality. The work performed in this task consisted of a field measurement program at four private homes with gas stoves in the Hartford, Connecticut area. The homes selected represented a spectrum of conditions related to:

Home age, size, and configuration

Stove age and condition

Stove use

Home location in relation to outdoor sources.

The field sampling program was divided into two sampling periods, spring-summer and fall-winter and carried out at three separate homes during each period.

Because of sparsity of stove use at one of the houses sampled in the spring-summer sampling period, another house was selected and used as a replacement for this house during the fall-winter sampling period. Thus, in all, four different houses were investigated during this task. Nitric oxide (NO), nitrogen dioxide (NO_2), and carbon monoxide (CO) were monitored continuously at three locations within and at one location outside each house for about two weeks in each sampling period.

The data were compiled as 2-hour and daily averages. Stove use data recorded by the residents provided the basis for our evaluation of the impact of gas stoves on indoor air quality.

2.0 SUMMARY AND CONCLUSIONS

2.1 Summary

During the spring and early summer of 1973, and again in the following fall and winter, TRC conducted a measurement program in three private residences to determine the effect of internal generation of pollutants from gas appliances upon indoor air quality. A modern suburban home, an older urban home, and a suburban two-story apartment each with a gas stove were selected for the program. After the spring-summer sampling period, we decided to replace the older urban home because of little stove use. Thus, for the fall-winter period, a replacement home was selected. It was a 14-year old suburban, single-family home in a development of similar homes.

Approximately two weeks of monitoring for nitrogen dioxide (NO_2), nitric oxide (NO) and carbon monoxide (CO) were conducted at each structure. Three sampling sites inside each structure and one outside were used as data collection points.

In order to sample at all four locations simultaneously and yet conserve equipment and manpower, TRC designed and built a measurement system that enabled the use of a single analyzer for NO_2 and NO and a second analyzer for CO. An electronic timer, solenoid valves and continuously purged sampling lines were used to permit the analysis of sample streams from each location in rapid sequence.

During the spring-summer sampling period the four sampling locations for each house were: kitchen (over the stove, except as noted below), living room, bedroom and outside. At the request of the Project Officer, sampling during the fall-winter period was modified somewhat. A second sampling position was located in the kitchen but displaced somewhat from the stove. The purpose of this sampling point was to provide data which would be more representative of the generalized kitchen atmopshere than the sampling point immediately adjacent to the stove. The third sampling point was placed in the living room during the first week and in the bedroom during the second week of the 2-week sampling period.

At House No. 1, during the spring-summer sampling period, we initially encountered a number of off-scale readings and subsequently moved the kitchen sampling location about 1 meter from the stove, over the sink for the rest of this period.

All monitoring equipment was placed inside the structure sampled and serviced usually every other day by a TRC staff member.

All field data were recorded on strip charts which were examined and verified before reduction to five-minute average values using a semi-automatic chart reading instrument. The five-minute data were then keypunched and entered into TRC's computer to facilitate data analysis.

A summary of the data for this task is presented in Table 2-1. The data show that there are significant differences in the indoor patterns of pollutants within each of the houses which are undoubtedly a function of house design, stove use patterns, outdoor concentrations and other factors. However, two points are clear: (1) Except for CO in House No. 2, the concentrations of the pollutants measured are higher inside than outside and (2) kitchen concentrations are always higher than those in other parts of the house.

Indoor concentrations of NO_2 in the kitchen at most of the houses are at levels which would exceed the annual average air quality standard of 100 $\mu g/m^3$ if projected over one year. In several instances, a concentration of 100 $\mu g/m^3$ is approached or exceeded throughout the house. Indoor CO concentrations during the winter at House No. 3 and No. 4 approached the 8-hour average air quality standard of 10,000 $\mu g/m^3$.

TABLE 2-1

SUMMARY OF INDOOR/OUTDOOR AIR QUALITY DATA IN EACH HOME FOR BOTH SEASONS
(Spring-Summer 1973 and Fall-Winter 1973-74)

House No.	Sampling Period	Pollutant	Average Concentration at Each Location, µg/m³					Total Stove (Oven Plus Burners) Min/Day	Number of Days of Valid Data (1)
			1-Kitchen Over Stove	1A-Kitchen 1M from Stove	2-Living Room	3-Bedroom	4-Outside		
1	Spring-Summer	NO_2	----	100	61	52	44	220	6
		NO	----	102	64	65	26	220	6
		CO	----	4490	4070	4170	3480	198	9
	Fall-Winter 1st Half	NO_2	67	60	55	----	50	134	7
		NO	136	134	94	----	63	134	7
		CO	4190	3520	3230	----	1670	106	4
	Fall-Winter 2nd Half	NO_2	110	67	----	49	46	(2)	6
		NO	134	131	----	102	65	(2)	6
		CO	4790	4210	----	3830	2310	(2)	6
2	Spring-Summer	NO_2	113	----	103	103	101	43	5
		NO	41	----	30	28	24	43	5
		CO	3000	----	3080	2900	2940	43	3
3	Spring-Summer	NO_2	114	----	75	58	51	11	2
		NO	53	----	42	34	21	11	2
		CO	4310	----	3210	2680	2230	37	13
	Fall-Winter 1st Half	NO_2	53	47	28	----	35	20	1
		NO	111	95	42	----	40	20	1
		CO	7820	6420	5070	----	3380	66	6
	Fall-Winter 2nd Half	NO_2	180	140	----	70	32	74	3
		NO	111	101	----	64	20	74	3
		CO	7130	6620	----	5500	2500	115	8
4	Fall-Winter	NO_2	213	120	71	----	39	139	7
		NO	305	229	156	----	19	139	7
		CO	9070	9000	8190	----	2410	201	6

(1) Data are based on all valid daily averages for each house during the season sampled, i.e., days for which 12 two hour average values were available.

(2) Stove use data not available for second half of fall-winter period for this house.

Using a study of brief records from the continuous analyzers together with stove use data showed clearly the response of indoor air quality throughout the house to stove use. A statistical analysis of the 5-minute air quality data showed the frequency of occurrence of various values for each sampling location. In most cases, the relative positions of the cummulative frequency distribution curves could be explained in terms of season, stove operation, and the behavior of the pollutant in question.

A diffusion experiment conducted at House No.2 showed the decay patterns of NO_2, NO and CO. NO_2 was found to decay much more rapidly than the other pollutants, and several possible theories were postulated.

The study showed that the impact of continuously burning pilot lights on several of the stoves contributed air contaminants to the indoor atmosphere.

2.2 Conclusions

Based upon the findings of this task effort we draw the following conclusions:

1. Stove use and outdoor air quality both influence indoor air quality. This joint influence is a function of house permeability as determined by season. No evidence could be found that stove and house age *per se* influenced indoor air quality.
2. The patterns of indoor air quality are influenced by interior design features.
3. The half life of CO, an extremely unreactive gas, was found to be 2.1 hours in House No.2 during an unoccupied period. The half life for NO was 1.8 hours indicating its relatively high stability in the indoor atmosphere. On the other hand, NO_2 had a half life of 0.6 hours

indicating that in addition to dispersion and dilution, NO_2 disappears through reaction, absorption, and/or adsorption. This effect was noted in a qualitative way in several of the other houses, especially House No. 4 in the winter.

4. Stove pilot lights were found to be a significant source of NO_2, especially at House No. 3.
5. If one can assume that an outdoor air quality standard can be applied indoors, the data show that the air quality standard for CO (8-hour average) can be exceeded.
6. Average kitchen NO_2 concentrations for most sampling periods were two to four times the outdoor NO_2 concentrations.

3.0 PROCEDURES

3.1 Structure Selection

The field measurement program was designed specifically to evaluate the effect of gas cooking appliances on indoor pollutant levels. While gas stoves are certainly not the only source of indoor pollutants, they are a readily identifiable source about which little is known. The major pollutants of interest that are emitted from gas appliances are nitrogen dioxide (NO_2), nitric oxide (NO), and carbon monoxide (CO). Four structures, a modern suburban house, a suburban 2-story apartment, an older, urban single-family house and a medium size and age, suburban, single-family house were selected for the measurement program. Table 3-1 lists the characteristics of the four structures.

These residences represent the wide differences in land use, house type and layout, gas applicance age and life styles which are desirable in an exploratory study such as this.

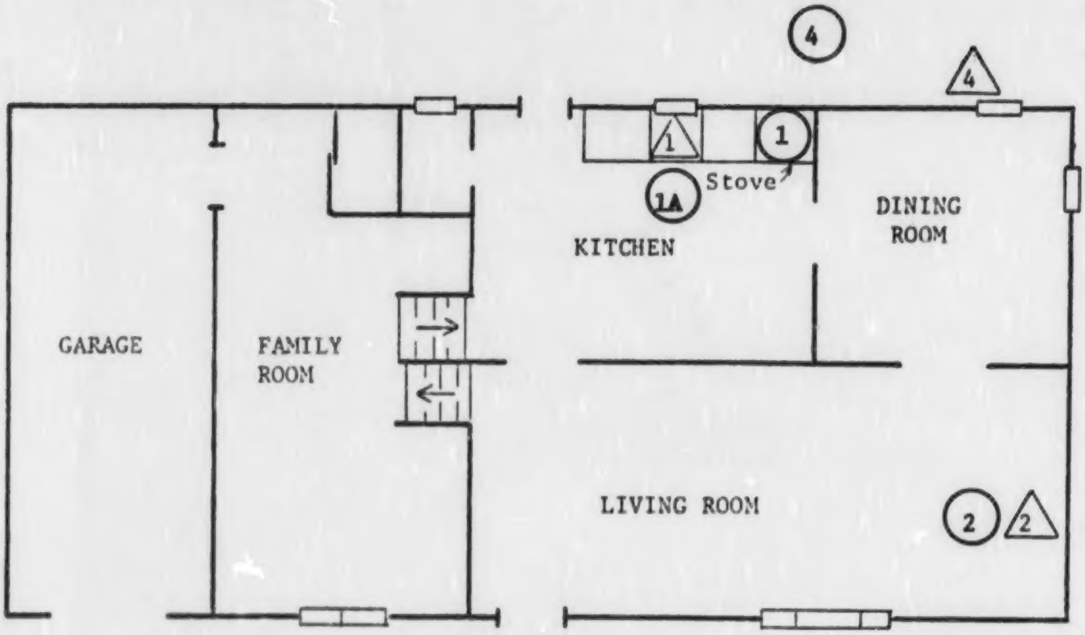
We chose House No. 1 as representative of a large, modern split-level house with approximately 2000 ft^2 of floor area. Figure 3-1 is a schematic diagram of this house and Figure 3-2 is a photograph of the house. House No. 1 is in a residential development of similar homes in Rocky Hill, Connecticut, and is located about 2400 feet west of Interstate 91 which is a major north-south highway that follows the Connecticut River Valley. This eight-year old house consists of four half-levels each spaced approximately 3 or 4 steps above the other in a split-level arrangement. The kitchen is large and open and directly connected to the dining, living and family rooms. The stove, which is the same age as the house, is located on an exterior wall near a window and has a recirculating type exhaust hood above the surface burners. A family of four occupies the house. The children are teenagers and the housewife does not have an outside job.

TABLE 3-1

CHARACTERISTICS OF FIELD PROGRAM RESIDENCES

Characteristics	House No. 1	House No. 2	House No. 3	House No. 4
Type	Split-level, large, centrally located and well ventilated kitchen	Two-story, medium size, centrally located and well ventilated kitchen	Two-story apartment with small, unventilated kitchen	Single story, small ranch-style, kitchen open to other areas of house.
Size	2000 Ft^2	1500 Ft^2	1000 Ft^2	1500 Ft^2
Age*	8 Years	40 Years	2 Years	14 Years
Location	Suburban development 1/2 mile from interstate highway	Urban residential area on local artery	Suburban community	Suburban development near local main road
Gas Appliances	Stove and heating system	Stove	Stove	Stove and heating system
Occupants	Two adults and two teenage children	Single adult	Two adults and two preschool children	Two adults and two children

* For both residence and gas appliances.


4
4
1
1
1A
Stove
KITCHEN
DINING ROOM
GARAGE
FAMILY ROOM
LIVING ROOM
2
2

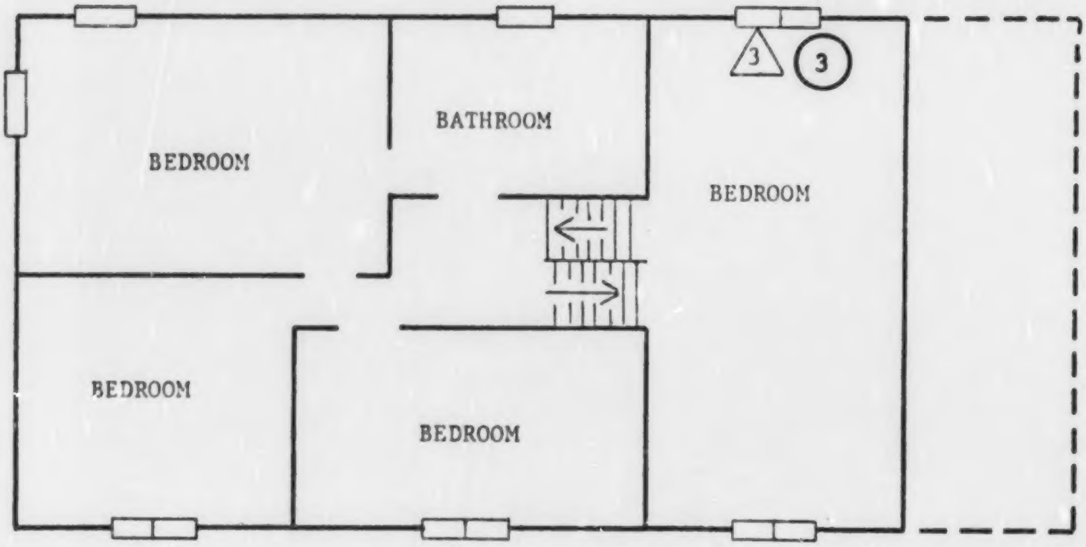
FIRST FLOOR

LEGEND:

Sampling Locations

△ **Spring-Summer**

○ **Fall-Winter**


BEDROOM
BATHROOM
3
3
BEDROOM
BEDROOM
BEDROOM
BEDROOM

UPPER LEVELS

FIGURE 3-1

Plan Layout of House No. 1

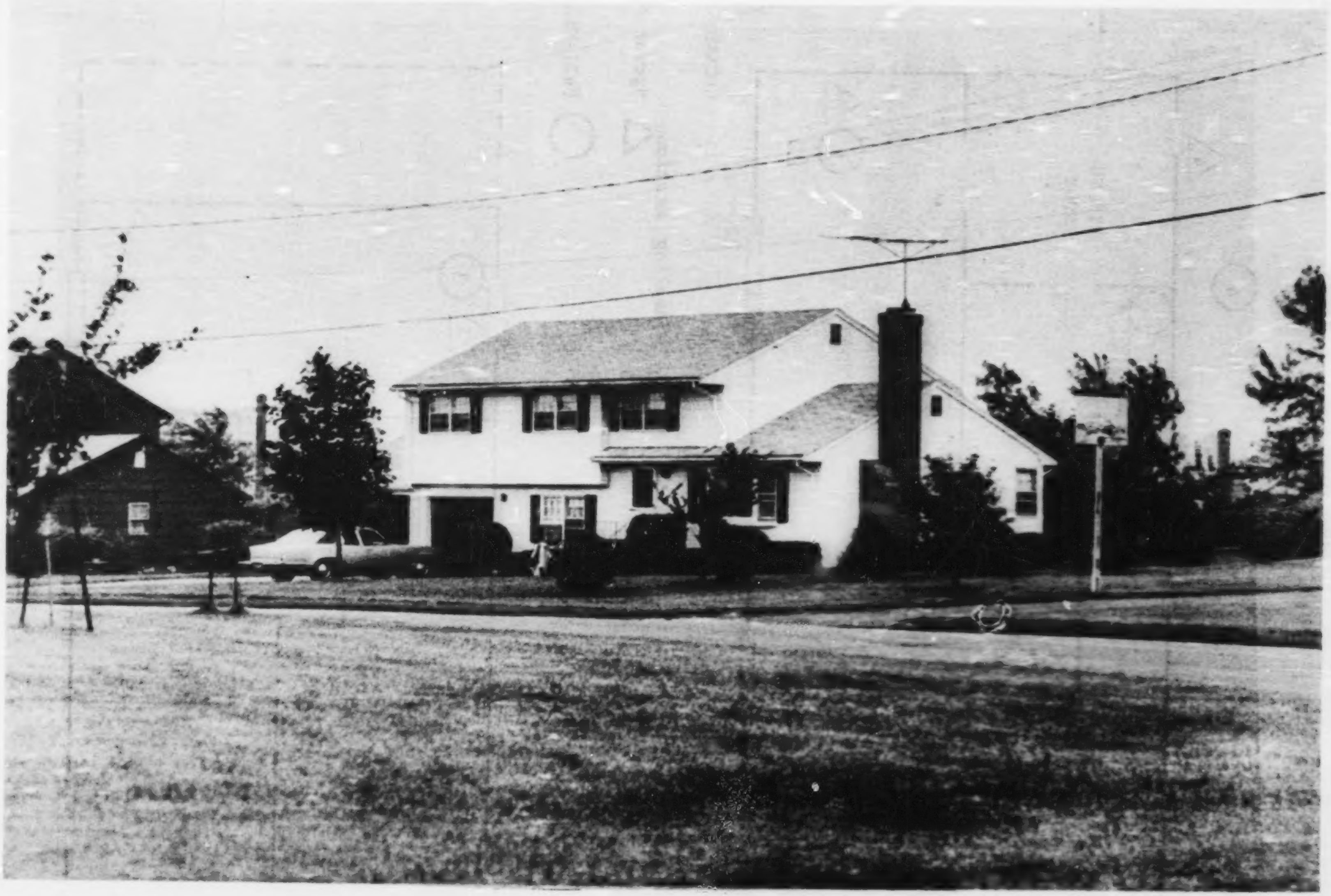


FIGURE 3-2   Front view of House No. 1

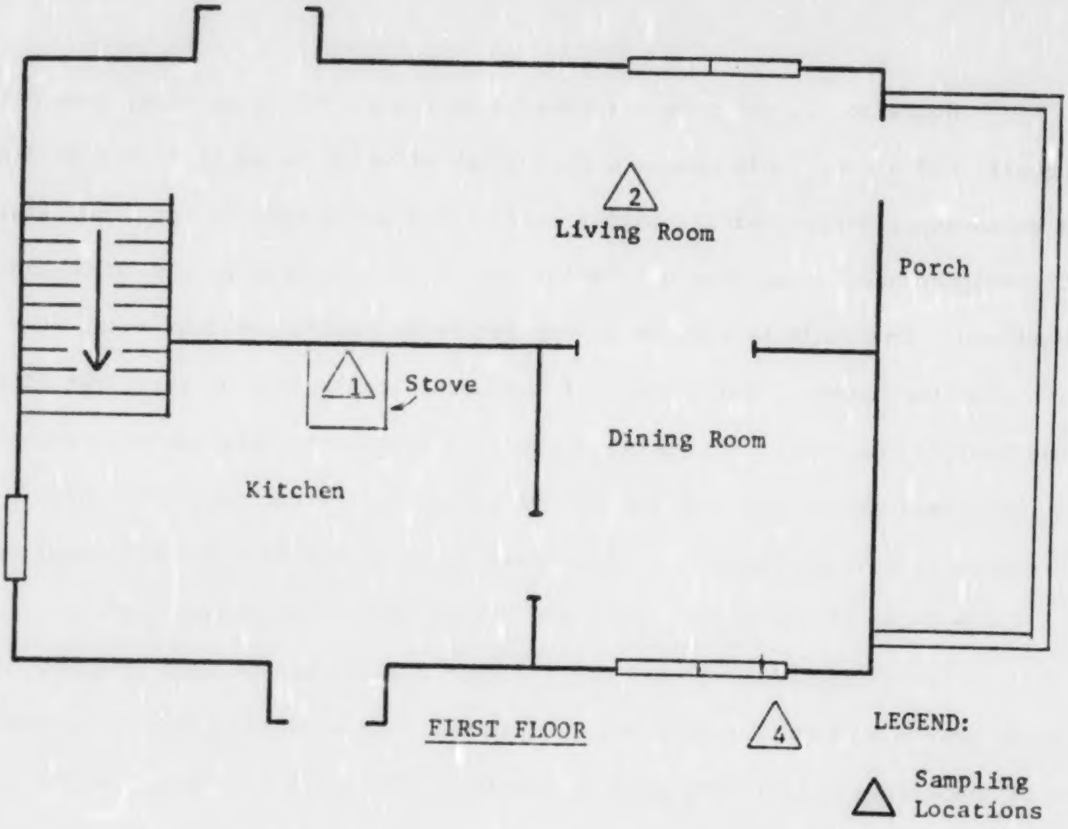
House No. 2, shown as a schematic in Figure 3-3 is an older home with an equally old stove. This house, a photograph of which is shown in Figure 3-4, is a seven-room, 2-story single family dwelling of about 1500 ft^2 of floor area. The neighborhood is an area of similar aged houses located in the south-end of Hartford. Campfield Avenue, an artery for local traffic in that area, runs in front of the house. Living areas of the house are located on the first floor and bedrooms upstairs. The stove is located next to an interior wall and there is no exhaust hood. The oven exhaust is vented to the outside. The only occupant is a young bachelor. This house was not used for the fall sampling period because of the sparse stove use during the spring-summer period.

The third dwelling used for the Task 2 field measurement program, is shown schematically in Figure 3-5. House No. 3 is a two-floor, 4-room apartment with the kitchen and living area on the first floor and 2 bedrooms on the second floor. A photograph of this home is shown as Figure 3-6. This dwelling is part of a garden apartment complex in the town of Newington, Connecticut. This complex is located approximately 500 feet north and west of local main roads. Although the area surrounding the complex is commercial and residential, large tracts of undeveloped land lie to the north and to the west of this apartment.

On the first floor there are no openings to the outside except the front door and a glass sliding door at the opposite end of the living area.

Typical of many modern apartments, the kitchen is only a small workspace with no windows or other outside ventilation. There is a recirculating type hood over the stove. The housewife and two small children are normally home during the day.

The fourth dwelling used for the Task 2 field measurement program, House No. 4, replaced House No. 2 for the fall sampling period. A plan


2
Living Room
Porch
1
Stove
Dining Room
Kitchen
4
LEGEND:
Sampling Locations

FIRST FLOOR

UPPER LEVEL

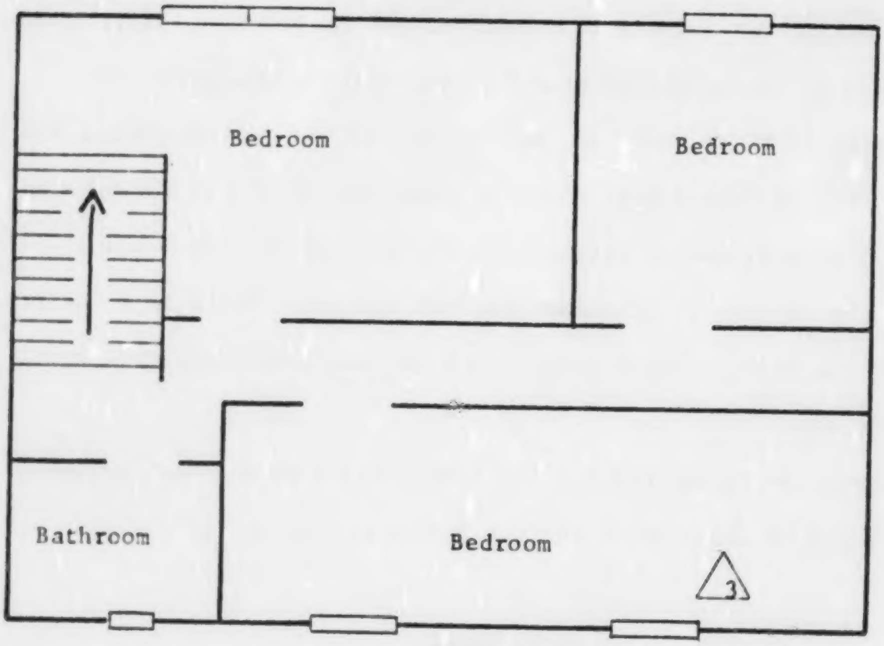

Bedroom
Bedroom
Bathroom
Bedroom
3

FIGURE 3-3
Plan Layout of House No. 2

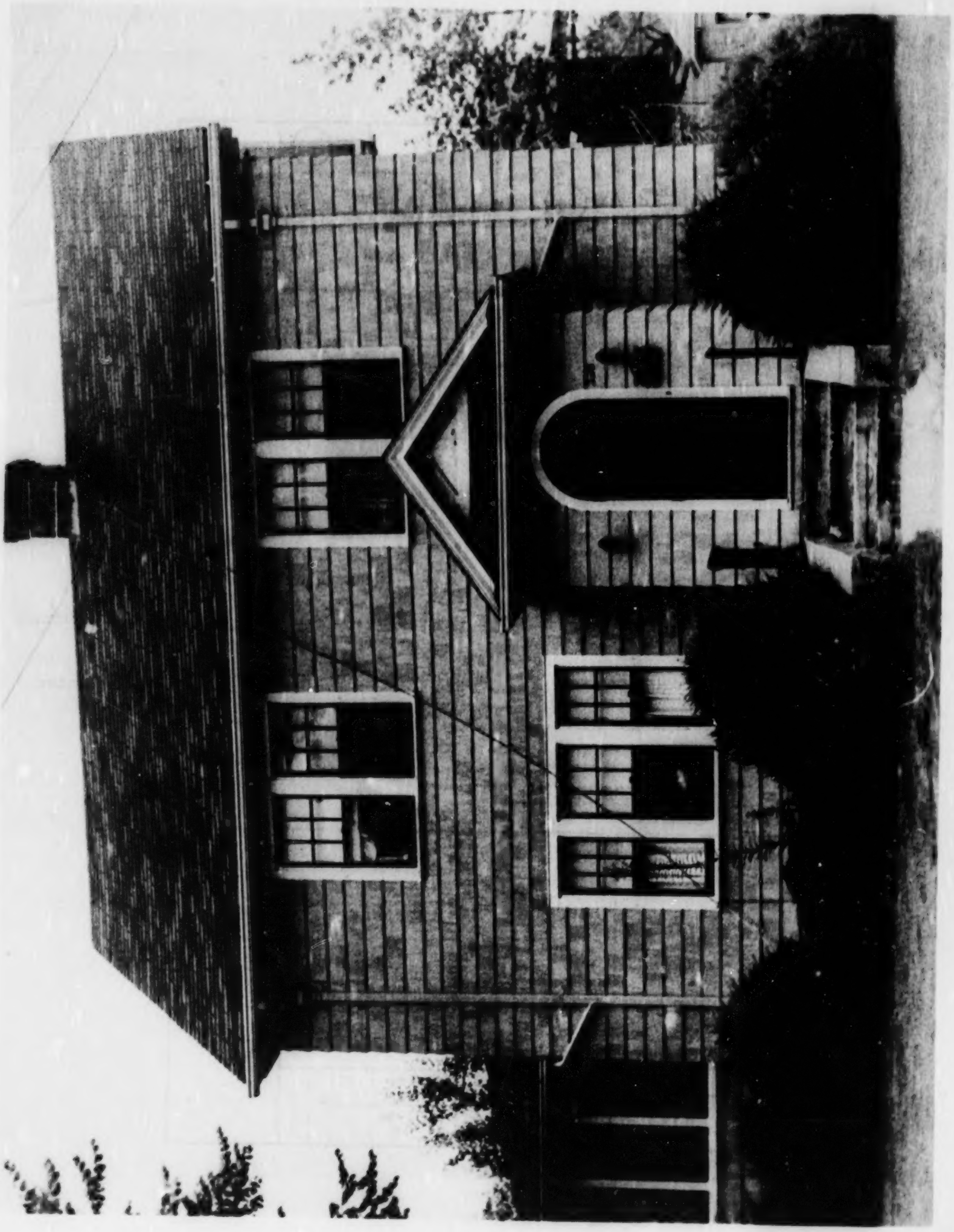
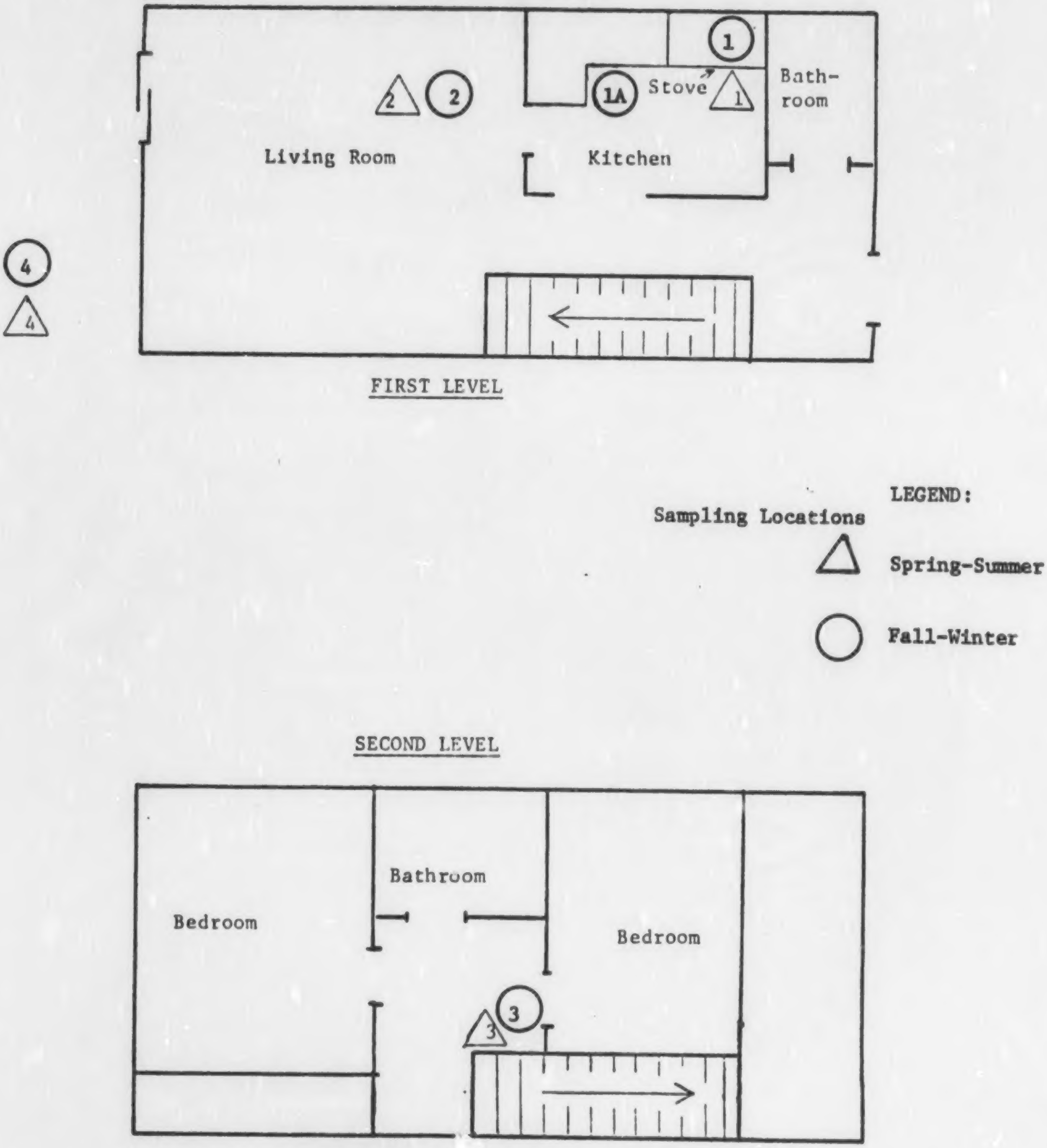


FIGURE 3-4 Front view of House No.2



1
Stove
1
Bath-room
2
2
1A
Living Room
Kitchen
4
4
FIRST LEVEL
LEGEND:
Sampling Locations
Spring-Summer
Fall-Winter
SECOND LEVEL
Bathroom
Bedroom
Bedroom
3
3

FIGURE 3-5
Plan Layout of House No. 3

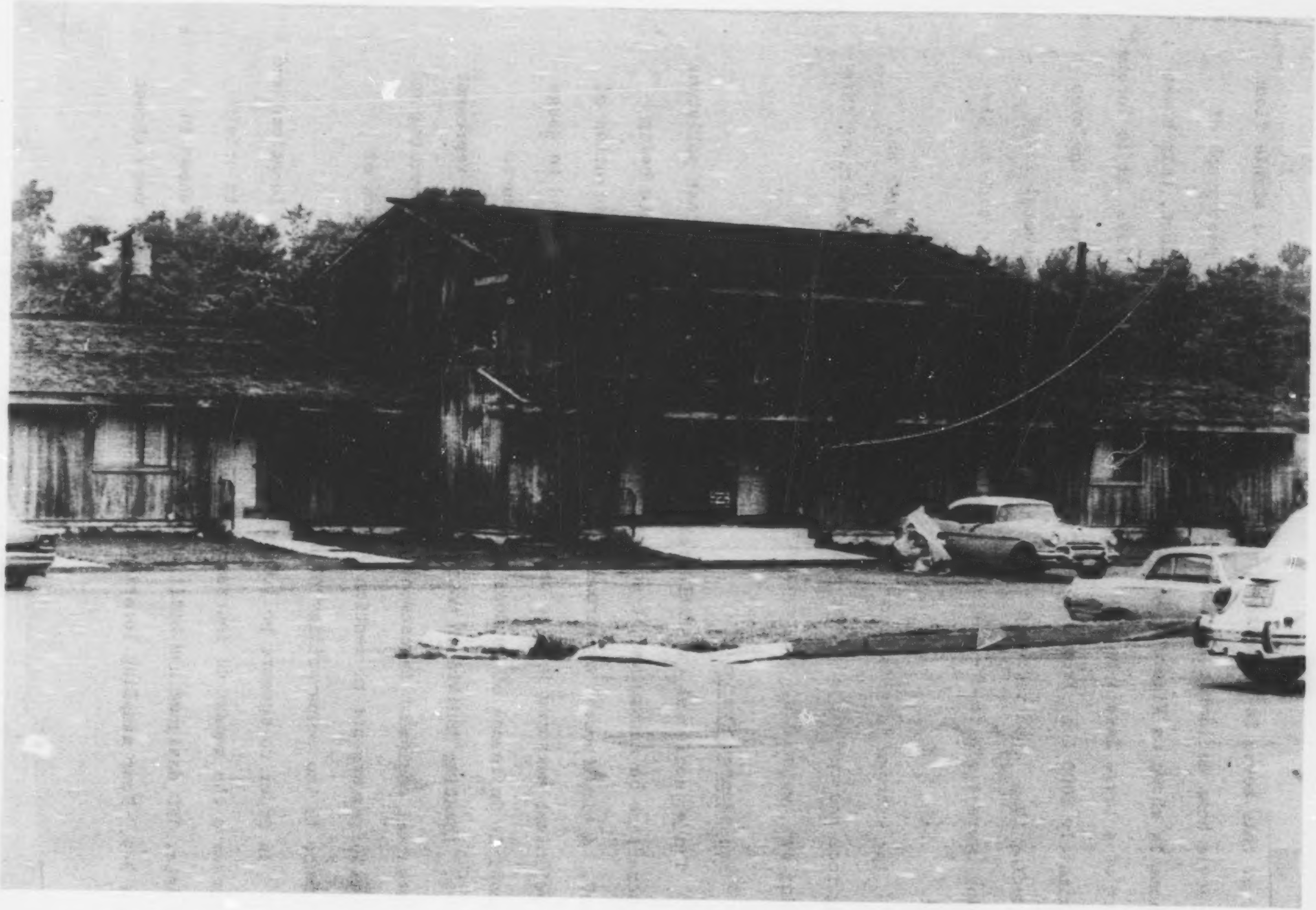


FIGURE 3-6 Front view of House No. 3

layout of this house is presented in Figure 3-7. This house is a single floor ranch-style home enclosing approximately 1500 square feet. A photograph of this home is shown as Figure 3-8. Located in Enfield, Connecticut, this house is part of a large development of similar dwellings built in 1959. It is located approximately 1000 feet from a local main thoroughfare, Elm Street. The area surrounding this house is zoned residential and commercial. Several large shopping centers lie to the south of this house, on the opposite side of Elm Street.

The kitchen in this house opens directly into the dining area and living room and the stove is not vented to the outside. The occupants of this dwelling are two adults, one teenager and one young adult.

3.2 Measurement System

The objective of the field measurement program dictated that pollutant concentrations be determined at several points within the structure being sampled. A simultaneous measurement of the ambient outdoor concentration of each pollutant measured is also desirable to act as a reference and to gauge the possible influence of outdoor concentration on the levels measured indoors. Locating individual monitors at each sampling point would represent a substantial equipment investment and would result in multiple servicing and space requirements,not to mention data reduction problems, and lack of confidence in the comparability of data from point to point.

In order to measure pollutant concentrations at multiple locations and yet conserve the amount of instrumentation and manpower required to obtain this data, TRC designed and built a unique measurement system as shown in Figure 3-9. Four sampling locations as described in Section 3.4 were chosen

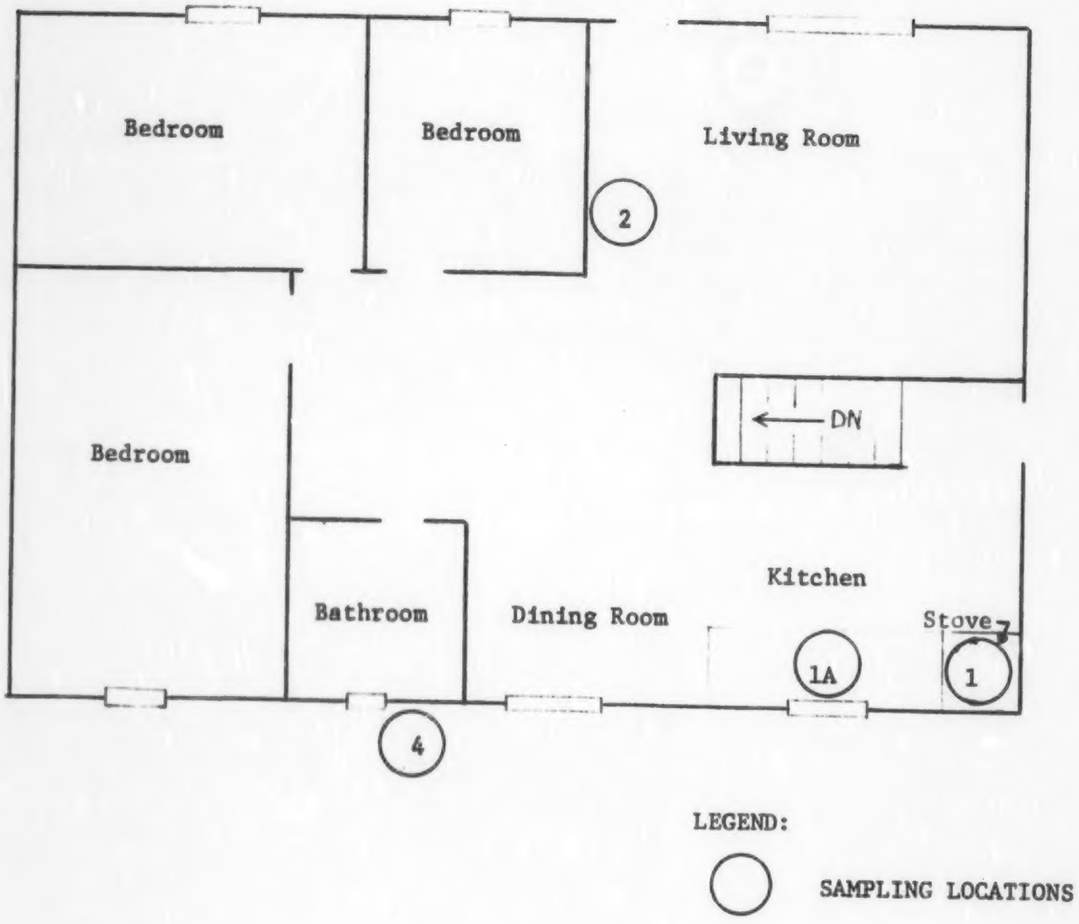

Bedroom
Bedroom
Living Room
2
Bedroom
DN
Kitchen
Bathroom
Dining Room
Stove
1A
1
4
LEGEND:
SAMPLING LOCATIONS

FIGURE 3-7
Plan Layout of House No. 4

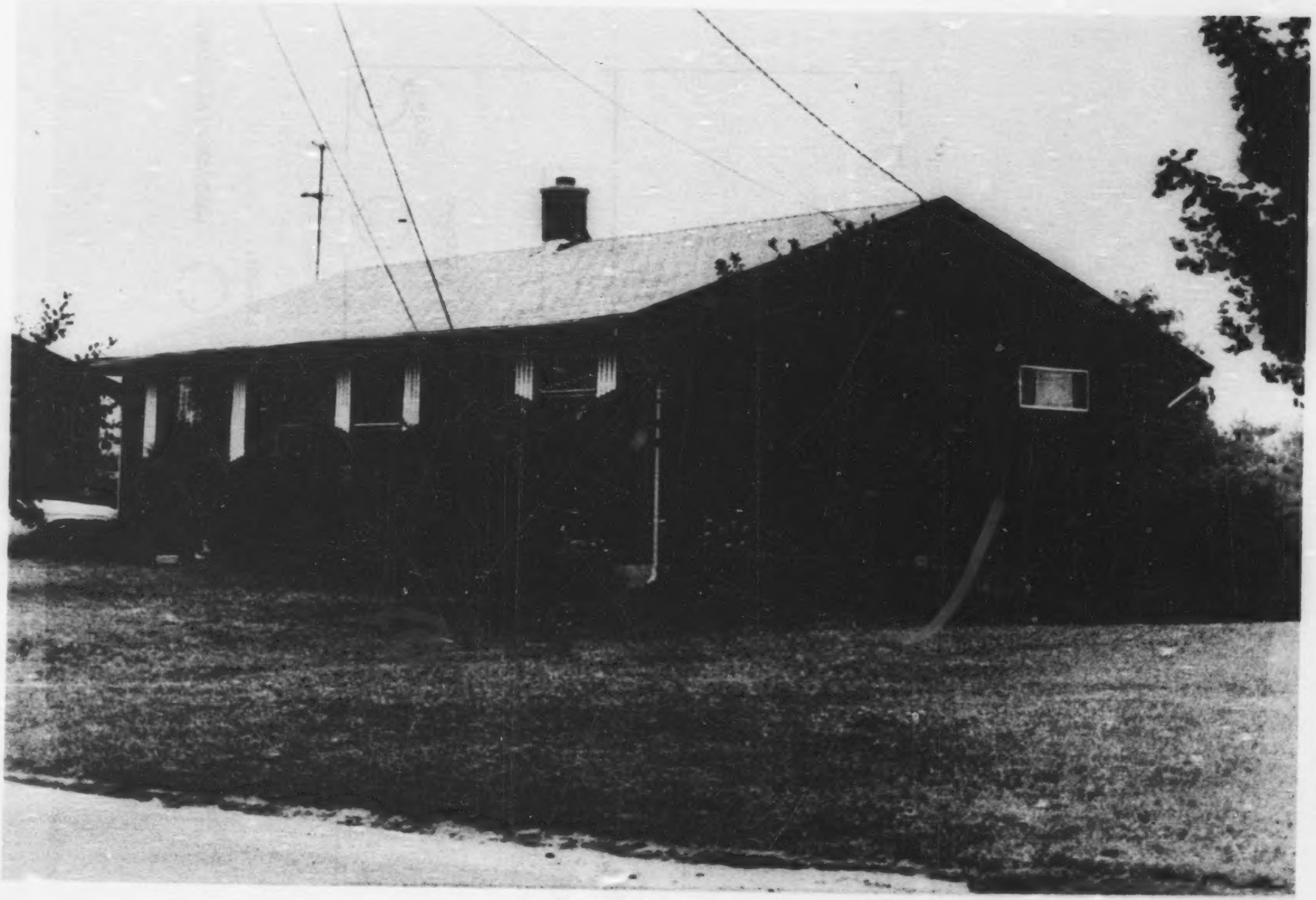


FIGURE 3-8 Oblique front view of House No. 4

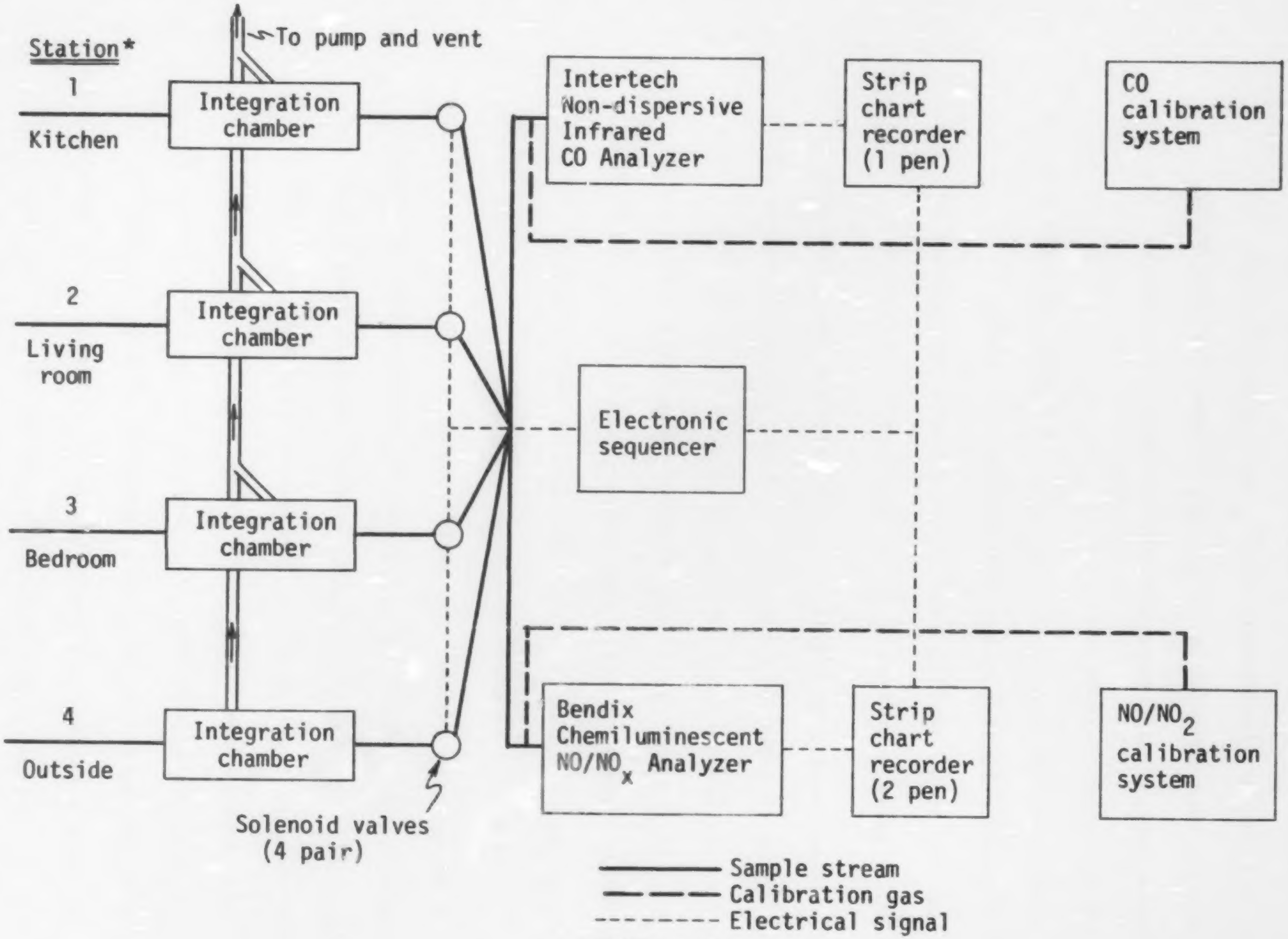

Station*
1
Kitchen
2
Living room
3
Bedroom
4
Outside
To pump and vent
Integration chamber
Integration chamber
Integration chamber
Integration chamber
Solenoid valves (4 pair)
Intertech Non-dispersive Infrared CO Analyzer
Strip chart recorder (1 pen)
CO calibration system
Electronic sequencer
Bendix Chemiluminescent NO/NO$_x$ Analyzer
Strip chart recorder (2 pen)
NO/NO$_2$ calibration system
Sample stream
Calibration gas
Electrical signal

FIGURE 3-9

NO, NO_2, and CO Sampling and Measurement System

*Configuration used during Spring-Summer period.

for sampling, three indoors and one outside. The major components of the system are four continuously purged sampling lines with an integrating chamber, solenoid valves, Bendix chemiluminescent NO/NO_x analyzer, Intertech Non-Dispersive Infrared Carbon Monoxide Analyzer, carbon monoxide and NO/NO_2 Calibration Systems, strip chart recorders and electronic sequencer. The system design acknowledged the need for:

(1) Continuous, uninterrupted operation with only periodic service
(2) Frequent automatic and manual calibration checks
(3) Ability to be readily moved from one location to another
(4) Small space requirement within the sampled structure.

As shown schematically in Figure 3-9 the sample stream from each of the four locations is piped to a central location through 15 meters of 4.8 millimeter I.D. Teflon tubing at a rate of approximately 9.5 LPM. This is equivalent to a retention time of approximately 2 seconds. Each sample stream is then drawn through an individual 500 ml glass integrating chamber, through a diaphram pump and then vented. This arrangement provides continuous purging of the sampling lines.

From the integrating chamber two small streams are drawn, one to the Bendix Chemiluminescent NO/NO_x analyzer and the other to the Intertech NDIR CO analyzer. Solenoid valves (normally closed) on each sample line are energized by the electronic sequencer at five-minute intervals with each station having its sample being drawn to the detectors once every twenty minutes. The two solenoid valves that allow samples to be drawn to the CO analyzer and the NO/NO_2 detector from the integration chamber are kept in phase so that the sample stream from each station is being analyzed simultaneously for CO and NO/NO_2. A two-pen recorder was used for the NO and NO_2 output of the chemiluminescent analyzer and a separate single pen unit for recording the CO output.

An additional function of the electronic sequencer was to mark the beginning of each 20-minute sampling cycle. This was accomplished by creating a vertical slash on each strip chart immediately before the analysis of the Station 1 sample stream for the three pollutants of interest. A sample of an NO/NO_2 trace is shown in Figure 3-10.

3.3 Calibration Procedures

Calibration of the Bendix Chemiluminescent NO/NO_2 analyzer was accomplished with a dynamic dilution module. This module was provided by the Environmental Protection Agency and is described schematically in Figure 3-11. A wide range of concentrations of NO and NO_2 can be generated by this unit for calibrating the NO/NO_2 analyzer. Bottled NO calibration gas with a guaranteed and EPA verified concentration of 95.1 ppm and purified room air are used to produce the various nitric oxide concentrations. Nitrogen dioxide can be produced in different concentrations by the use of the ozone generator that is part of the dilution module.

The procedures used to calibrate the Bendix Chemiluminescent NO/NO_2 Analyzer were provided by the EPA. A copy of the procedures can be found in Appendix A.

The calibration of the non-dispersive infrared (NDIR) carbon monoxide analyzer was accomplished with zero gas and 13.0 ppm CO calibration gas. Zero gas was introduced into the detector cell to establish the zero baseline of the device. Calibration gas was then used to determine the span, or chart displacement, of the known concentration of carbon monoxide. Finally, the zero gas was re-introduced to ensure the baseline stability. The electronic sequencer automatically charged zero gas to the NDIR CO analyzer once every twenty-four hours as another check for baseline stability between manual calibrations.

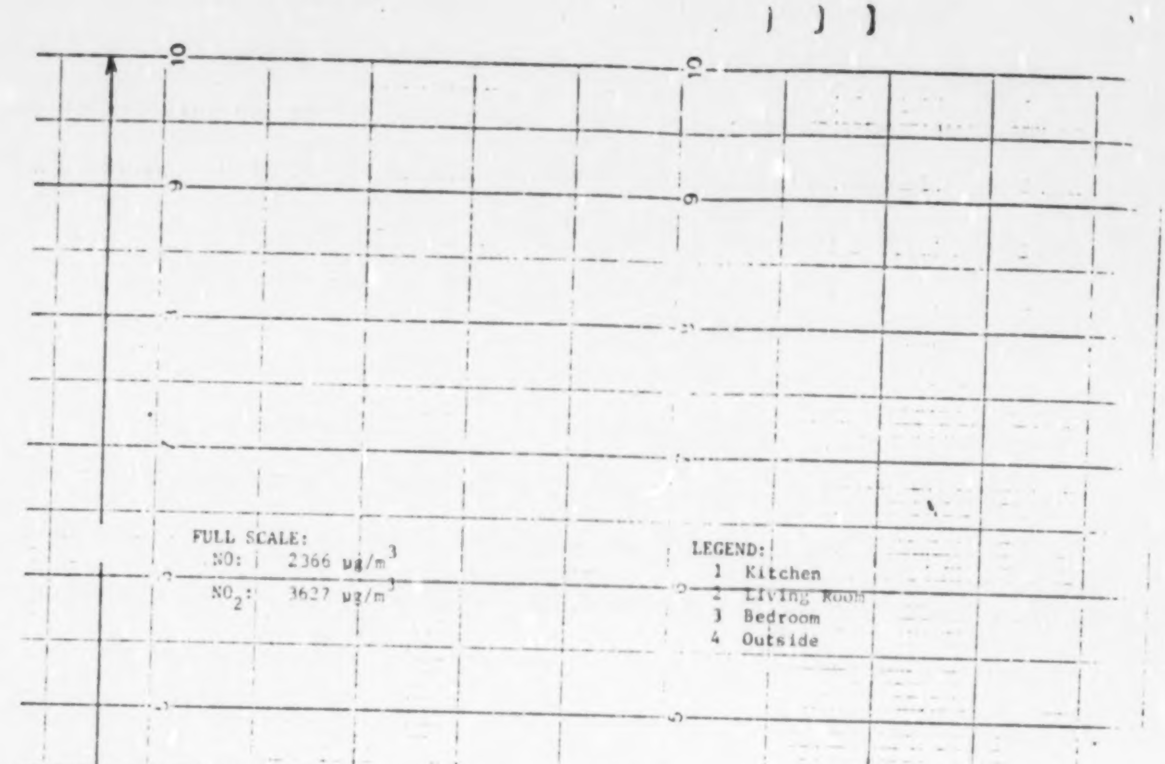


FIGURE 3-10

Sample NO/NO_2 Trace

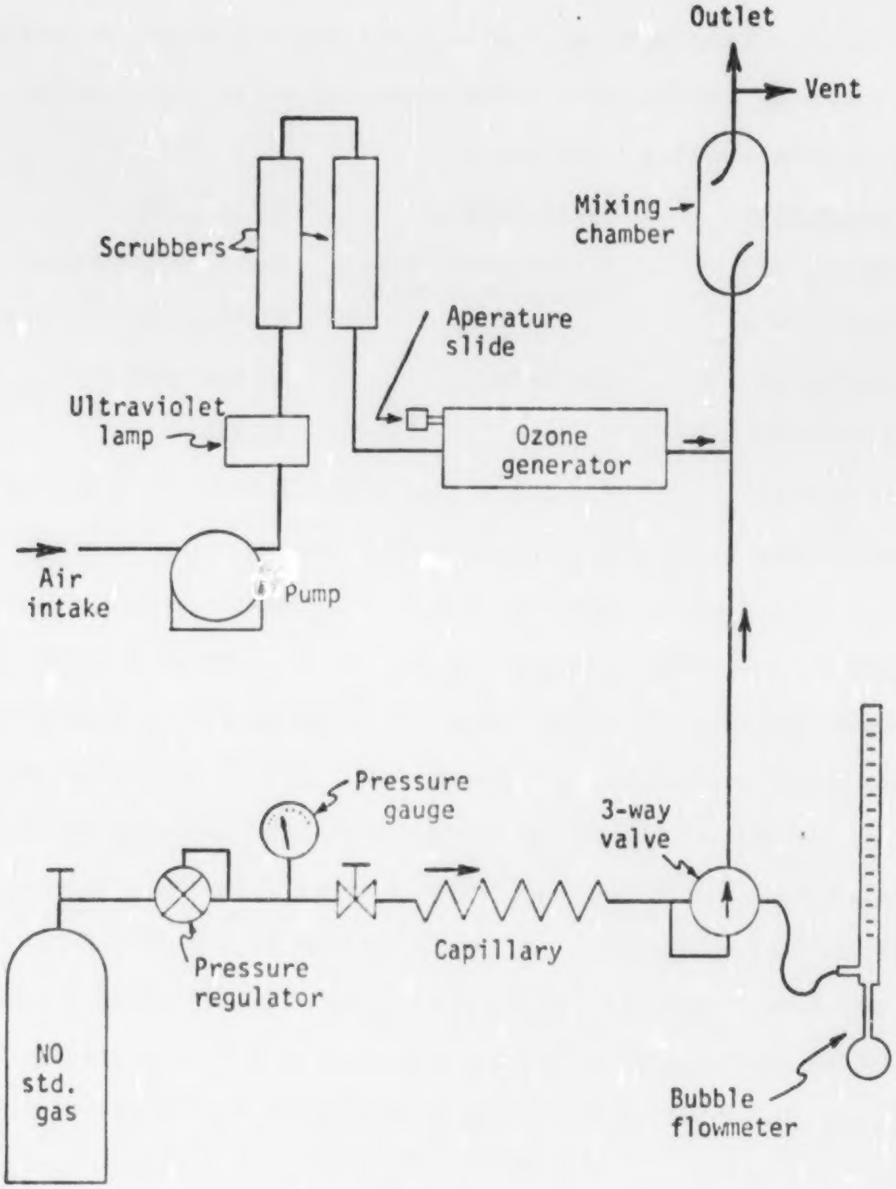

Outlet
Vent
Mixing chamber
Scrubbers
Aperature slide
Ultraviolet lamp
Ozone generator
Air intake
Pump
Pressure gauge
3-way valve
Pressure regulator
Capillary
NO std. gas
Bubble flowmeter

FIGURE 3-11

NO - NO_2 Calibration System

3.4 Field Operations

The sampling equipment and auxiliary calibration devices were installed in an unobtrusive location in each house that would not result in interference with the residents' activities. Teflon sample lines were run from the equipment to four sampling locations:

Designation	Spring-Summer	Fall-Winter
Station #1	Kitchen-Over Stove (except Home No. 1)	Kitchen-Over Stove
Station #1A		Kitchen-Approx. 1 meter from Stove
Station #2	Living Room	Living Room
Station #3	Bedroom	Bedroom
Station #4	Outside of Structure	Outside of Structure

The sample intake for each station was placed in the breathing zone, between 1.4 and 1.8 meters above the floor. The sample intake for Station #1, in the kithcen, was placed directly over the stove except at House No. 1 during the spring-summer sampling period. For this sampling period at House No. 1, the sample intake was placed approximately 1 meter from the stove. This location corresponds to Station 1A for the fall-winter sampling period when it was possible to locate Station 1 directly above the stove. The data from Station 1 was used to determine the concentrations of NO_2, NO and CO at the source, the stove. Comparison of these data with those obtained from the other stations shows the behavior of the pollutants as they diffuse through the structure and the effect of the source on the indoor air quality within the structure.

Station 1A (placed approximately 1 meter from the stove) was used in the fall-winter sampling period to determine NO_2, NO and CO concentrations within the kitchen, other than directly above the stove. These data were intended to show the behavior of the pollutants in the vicinity of the stove as they diffuse from the source throughout the structure.

Station 2 was placed in the living room away from windows, doors and air conditioners. Station 2 was used (alternately with Station 3) for about half of the fall-winter sampling period at each house. Comparison of the data obtained from Stations 1, 1A and 2 was intended to show the characteristic changes in indoor air quality in an area on the same level as the source, at Station 1.

Station 3 was placed in an upper level bedroom to provide data to determine the relationship between concentrations in the kitchen and more remote areas within the structure, particularly where people spend 8 hours sleeping. As noted earlier, this sampling location was alternated with Station 2 during the fall-winter sampling period at each house with the exception of House No. 4. At this house, it was not possible to sample at Station 3 because of the inconvenience it would have caused the residents.

Station 4 was placed outside the structure to provide reference measurements for the pollutants measured indoors. Measurement of the outdoor pollutant concentrations was necessary to determine if they control the indoor concentration by infiltration. The net contribution of the stove to indoor air quality was determined by comparing the outdoor with the indoor concentrations.

After installation of the equipment and deployment of the sampling lines, TRC personnel verified their correct function in the operating mode. Calibration procedures as mentioned in Section 3.3 were used after a warm-up period of several hours and sampling of the four stations was started.

A form was developed for use by the housewife or other person using the kitchen to record pertinent data on stove use. The total number of minutes of oven and burner use were tabulated for each day of sampling. These forms provided a record of the level of use and the respective time of use of the stove that was useful for interpretation of the sampling data. A copy of this form is shown as Figure 3-12.

TRC personnel serviced the equipment at least every other day. The service included calibration and functional checks of the sampling equipment. Adjustments were made as necessary. The residents assisted by frequently recording time and events directly on the strip charts and alerting TRC to any possible malfunction that occurred.

In general, the instrumentation in the measurement system performed well and dependably for the duration of both portions of Task 2, except for several problems at House No. 3. The Bendix Chemiluminescent NO/NO_x Analyzer held its calibration and baseline very well and in retrospect we probably could have reduced the frequency of calibration checks.

Substantial data were lost at House No. 3 during the spring-summer sampling period by a combination of sticking solenoid valves for Stations 1 and 2.

Shortly after this problem was rectified, a solenoid valve in the Bendix Chemiluminescent NO/NO_x Analyzer malfunctioned, thus preventing separate determinations for NO and NO_2. We replaced this instrument with a back-up one and the amount of lost data was minimized.

FIGURE 3-12

STOVE USAGE FORM

PROJECT 32247 - A STUDY OF INDOOR AIR QUALITY

HOME OF ____________________

DATE ____________ MEAL: B ____ L ____ S ____ OTHER ____

LR
(1) TIME ON ____________
(2) TIME OFF ____________
(3) SETTING ____________
(4) TYPE OF FOOD PREPARED ____________
(5) DESCRIBE COOKING UTENSIL USED ____________

RR
(1) TIME ON ____________
(2) TIME OFF ____________
(3) SETTING ____________
(4) TYPE OF FOOD PREPARED ____________
(5) DESCRIBE COOKING UTENSIL USED ____________

LF
(1) TIME ON ____________
(2) TIME OFF ____________
(3) SETTING ____________
(4) TYPE OF FOOD PREPARED ____________
(5) DESCRIBE COOKING UTENSIL USED ____________

RF
(1) TIME ON ____________
(2) TIME OFF ____________
(3) SETTING ____________
(4) TYPE OF FOOD PREPARED ____________
(5) DESCRIBE COOKING UTENSIL USED ____________

	TIME ON	TIME OFF	TEMP., °F	TYPE OF FOOD PREPARED	DESCRIBE COOKING UTENSIL USED
OVEN					
BROIL			--		

TEST CONDITIONS

(1) EXHAUST FAN: ON ____ OFF ____
(2) KITCHEN WINDOW: OPEN ____ CLOSED ____
(3) AIR CONDITIONING: ON ____ OFF ____
(4) WHAT DOORS OPEN? ____________

COMMENTS:

Zero drift in the CO detector was a recurring problem during the spring-summer sampling period. In most cases, we were able to interpret the data adequately but in a few cases the baseline drift was so extreme that some data were lost. TRC personnel performed an extensive overhaul of the CO analyzer prior to the outset of the fall-winter sampling period and the CO zero drift problem was solved.

The schedule of monitoring periods was as shown below:

	Spring-Summer	Fall-Winter
House No. 1	May 9, 1973 to May 25, 1973	Nov. 6, 1973 to Nov. 21, 1973
House No. 2	May 29, 1973 to June 10, 1973	-----
House No. 3	June 11, 1973 to July 13, 1973	Nov. 28, 1973 to Dec. 28, 1973
House No. 4	----	Jan. 29, 1974 to Feb. 15, 1974

3.5 Data Summarization

The considerable amount of data accumulated from the field effort in Task 2 precluded manual examination of the data in its entirety. Semi-automatic analog to digital conversion equipment and computer programs were used to reduce the labor in the data evaluation process.

Each strip chart was examined and valid data periods were identified for further reduction. Those sections of the charts that showed questionable data were eliminated from evaluation. The data from the NO/NO_2 charts were converted to digital form and thence to punch cards using a Gerber analog-to-digital converter. The data from the CO charts were hand reduced, then transferred to coding forms for subsequent keypunching. Random samples of the punch cards were cross-checked with the original charts. Care was taken to insure that the data matched and keypunch errors were eliminated. Initial computer printouts included both concentration values and net chart division displacement to facilitate further checking of the results. The results were then put on punch cards or magnetic tape for additional analysis.

To develop diurnal trends in air quality at the three indoor and one outdoor sampling locations, we accumulated five-minute bits into two-hour averages. Occasionally, less than 6 (the maximum possible number) five-minute bits of data were available for each two-hour period since some data were lost during instrument servicing periods and during periods of instrument malfunctions. In a few isolated cases, there were as few as one or two five-minute bits for a given two-hour period. Nevertheless, we defined the two-hour average as the average of all five-minute bits in that period even though less than 6 bits might be available The data in Appendix B show the two-hour averages for each location and the number of five-minute bits used for calculation of the averages.

In calculating the daily averages, we gave equal weight to all two-hour averages even though some were based on less than 6 bits of data. However, a daily average was not computed for any day which had one or more two-hour average values missing for all four stations. Note in Appendix B that daily averages are shown only for those days in which a full compliment of two-hour averages were available.

In addition to the above summaries, we developed a number of summaries of the diurnal pattern of NO_2 for several of the house-pollutant-season combinations in terms of a "composite day". Here we determined the average concentration for each two-hour time interval for all those days for which 12 valid two-hour average values were available.

Frequency distributions for NO, NO_2 and CO data were compiled from all the five-minute data at each location for each house in order to assess the frequency of exposure to the range of concentrations measured during the field program. In constructing these distribution curves, we used all five-minute data and assumed that any loss of data during a sampling period was more or less randomly distributed by time of day. While these frequency distributions may not be statistically valid because of the loss of a certain amount of data, we believe they provide useful information. However, we did not include NO_2 and NO data from House No. 3 because we judged the loss of data for these pollutants at this house to be excessive.

In addition to the above data presentations, we plotted graphs showing the time history of NO_2, NO and CO for brief episodes in order to show the direct dependence of indoor concentrations on stove usage.

4.0 RESULTS AND DISCUSSION

The sampling data were organized and evaluated in terms of several different time averaging periods. The shortest time averaging period is the five-minute average concentration of each pollutant at each of the four sampling locations. For each sampling location there are three five-minute average readings in each hour. We chose to compile these five-minute readings into two-hour and daily averages in order to view the diurnal variation of pollutant concentrations as well as to compare the measured values on a daily basis.

The procedure for summarizing data was presented in Section 3.5. The air quality data for each house are presented in Appendix B and are organized as follows:

Appendix	House No.	Season
B-1	1	Spring-Summer
B-2	1	Fall-Winter
B-3	2	Spring-Summer
B-4	3	Spring-Summer
B-5	3	Fall-Winter
B-6	4	Fall-Winter

In each Appendix, the tables are organized for each of the pollutant gases in the order of NO_2, NO, and CO.

In some instances, we have prepared graphs of the five-minute data which illustrate short term episodes of interest. Finally, to provide a more meaningful indication of the pollutant concentrations to which the home occupants are exposed than would be shown by a hourly or daily average concentrations, a frequency distribution of all the five-minute average data for each pollutant was constructed.

4.1 House No. 1 - Suburban Split Level Home

During the spring-summer sampling period, the four sampling points were located as follows:

1. Kitchen (approximately 1 Meter from stove)
2. Living Room

3. Upstairs Bedroom
4. Outside

This was the first house we sampled in this program and early indications were that a kitchen sampling location directly above the stove would produce peak values which would exceed the capability of the nitrogen oxides sensing instrument. Thus, the sampling point was moved approximately 1 meter away from the stove for the two-week spring-summer sampling period. At the other three houses we found we were able to use a sampling point above the stove.

Between the spring-summer and fall-winter sampling period, the EPA Project Officer requested that data be collected at somewhat different locations during the fall period to provide additional data on diffusion of stove contaminants through the house. Thus, the sampling in the fall-winter period was somewhat different for each half of the two-week period as shown below:

FIRST HALF

1. Kitchen - above stove
1A. Kitchen - approximately 1 meter from stove
2. Living Room
4. Outside

SECOND HALF

1. Kitchen - above stove
1A. Kitchen - approximately 1 meter from stove
3. Bedroom
4. Outside

4.1.1 Nitrogen Dioxide (NO_2)

Tables 4-1 and 4-2 present data for House No. 1 during the spring-summer and the fall-winter sampling periods respectively. Even though stove use data for the second half of the fall sampling period were lost, the indoor/outdoor air quality data for this portion of the sampling period are reported. It is apparent in a general way from Tables 4-1 and 4-2 that NO_2 concentrations in this house are strongly influenced by stove use. During the spring-summer sampling the periods when daily average NO_2 concentrations in the kitchen were near or exceeded 100 $\mu g/m^3$ coincided with days of significant stove use.

TABLE 4-1

SPRING (1973) SAMPLING AT HOUSE NO. 1
DAILY AVERAGE NO_2 CONCENTRATION AND STOVE USAGE DATA

Date	Daily Average NO_2 Concentration, ($\mu g/m^3$)				Total Stove Use (min)	
	1-Kitchen (1 Meter from Stove)	2-Living Room	3-Upper Bedroom	4-Outside	Oven	Burner(1)
5/12/73	125	74	62	44	195	335
5/13/73	65	38	35	25	0	50
5/15/73	154	95	78	73	220	195
5/22/73	70	40	31	25	20	75
5/23/73	94	60	54	56	45	80
5/24/73	87	56	49	42	40	60
OVERALL DAILY AVERAGE	100	61	52	44		

(1) In this table and all subsequent tables of this type the burner use times are computed from the sum of all minutes of individual burner use during the day shown, e.g., if during a day three burners were on for 10 minutes, two burners on for 20 minutes, and one burner was on for 30 minutes, the total burner time would be (3 x 10) + (2 x 20) + 30 = 100 minutes.

TABLE 4-2

FALL (1973) SAMPLING AT HOUSE NO. 1
DAILY AVERAGE NO_2 CONCENTRATIONS AND STOVE USAGE DATA

Date	Daily Average NO_2 Concentration, $\mu g/m^3$					Total Stove Use, Min*	
	1-Kitchen Above Stove	1A-Kitchen 1 meter from stove	2-Living Room	3-Bedroom	4-Outside	Oven	Burner
11/07/73	67	56	59	--	35	55	76
11/08/73	98	77	97	--	57	130	62
11/10/73	28	28	16	--	20	0	21
11/11/73	62	50	34	--	32	165	113
11/12/73	71	64	51	--	64	70	59
11/13/73	84	95	78	--	86	70	98
11/14/75	62	53	51	--	58	0	20
OVERALL DAILY AVERAGE	67	60	55	--	50		
11/15/73	84	65	--	60	69	--	--
11/16/73	63	58	--	43	62	--	--
11/17/73	85	65	--	32	18	--	--
11/18/73	67	61	--	37	29	--	--
11/19/73	219	119	--	53	44	--	--
11/20/73	139	34	--	71	53	--	--
OVERALL DAILY AVERAGE	110	67	--	49	46		

* Stove use data not available during second half of period.

The same conclusion can be drawn for the fall-winter period, but it is not nearly as clear cut as for the spring-summer period. Relatively less stove use during the fall-winter period and higher outdoor NO_2 levels as compared to the spring-summer period contribute to a reduced indication of a direct cause and effect relationship between indoor NO_2 and stove use. During both sampling periods, there is an indication that the oven is more influential than the burners in contributing to levels of NO_2 indoors.

Outdoor concentrations appear to influence indoor concentrations to the extent that they penetrate the structure and produce indoor "background" levels to which indoor-generated NO_2 is added. This is shown in comparing the patterns of indoor/outdoor NO_2 for May 12 and 15, 1973, in Table 4-1. These were both days of relatively high and similar stove use, but outdoor NO_2 concentrations were quite different: 44 $\mu g/m^3$ on May 12 and 73 $\mu g/m^3$ on May 15th. Kitchen concentrations were higher on May 15 by about the same amount as outdoor concentrations as compared to May 12th. Furthermore, the relatively high outdoor concentrations on May 12 prevented the bedroom concentrations from getting below 78 $\mu g/m^3$ on a daily basis.

If a similar analysis is attempted on data for the fall-winter period (Table 4-2) it is not possible to show a clear-cut influence of outdoor NO_2 levels on indoor concentrations. This can be attributed largely to the house being closed up to a greater extent in November as compared with May.

Table 4-3 is presented to compare further the two sampling periods in House No. 1 in terms of average values over the entire sampling periods. In addition, we have computed non-kitchen values as a percent of the kitchen value (either directly over the stove in the fall-winter or 1 meter from the stove

TABLE 4-3

SUMMARY OF AVERAGE NO_2 VALUES AND STOVE USE

House No. 1 - Spring and Fall Sampling, 1973

Season and Data Category	Sampling Location					Average Stove Use (min/day)(1)		
	Kitchen above stove	Kitchen 1 Meter from stove	Living Room	Bedroom	Outside	Oven	Burner	Total(2)
Spring, 1973								
NO_2 Concentration, $\mu g/m^3$	--	100	61	52	44	87	133	220
% of remote kitchen value	--	100	61	52	--			
Indoor/Outdoor ratio	--	2.27	1.39	1.18	1.00			
Fall, 1973 (first half)								
NO_2 Concentration, $\mu g/m^3$	67	60	55	--	50	70	64	134
% max. kitchen value	100	90	82	--	--			
% remote kitchen value	--	100	91					
Indoor/Outdoor ratio	1.34	1.20	1.10	--	1.00			
Fall 1973 (second half)								
NO_2 Concentration, $\mu g/m^3$	110	67		49	46			
% max. kitchen values	100	61		45	--			
% remote kitchen value	---	100		69	--			
Indoor/Outdoor ratio	2.39	1.46		1.07	1.00			

(1) Stove use data not available for second half of fall period.

(2) The sum of oven and burner use. The two are not strictly additive but the sum is a useful reference in comparing sampling periods.

in the spring-summer); indoor/outdoor ratios; and relative stove use during the period.

Average stove use in the first half of the fall period was only 0.6 of the use in the spring. The ratio of fall to spring values for the comparable kitchen locations (1 meter from stove) was 0.6 and for the living room, 0.9. Although several interpretations of these values are possible because of the complex interplay of a number of effects, the most logical is that the more closed-up attitude of the house in the fall lessens dilution of NO_2 as it diffuses through the house. Furthermore, the relatively low concentrations inside the house during the fall relative to outside concentrations tend to obscure any dilution effects. Also, note in the data for the fall period (Table 4-2) that there are two instances where average living room concentrations exceeded those at the remote kitchen location 1 meter from the stove (See data for 11/7 and 11/8). On both days, outdoor NO_2 levels were considerably below those indoors. We attribute this to a lack of dilution of indoor air by outdoor air because the house is sealed relatively tightly.

Figures 4-1 and 4-2 are graphs showing the diurnal patterns of NO_2 in House No. 1 for the spring and first half of the fall periods respectively. These graphs are based on a "composite day" which was developed from the averages of all two-hour average values for a given time period for each of the complete sampling days (no two-hour average values missing).

These graphs show clearly the rapid drop off of NO_2 concentrations between the kitchen and the living room during the spring and the more gradual drop off between these two rooms in the fall. This presumably is the result of the house being more tightly closed during the colder weather. Note also the lack of a morning and noon kitchen peak during the fall period.

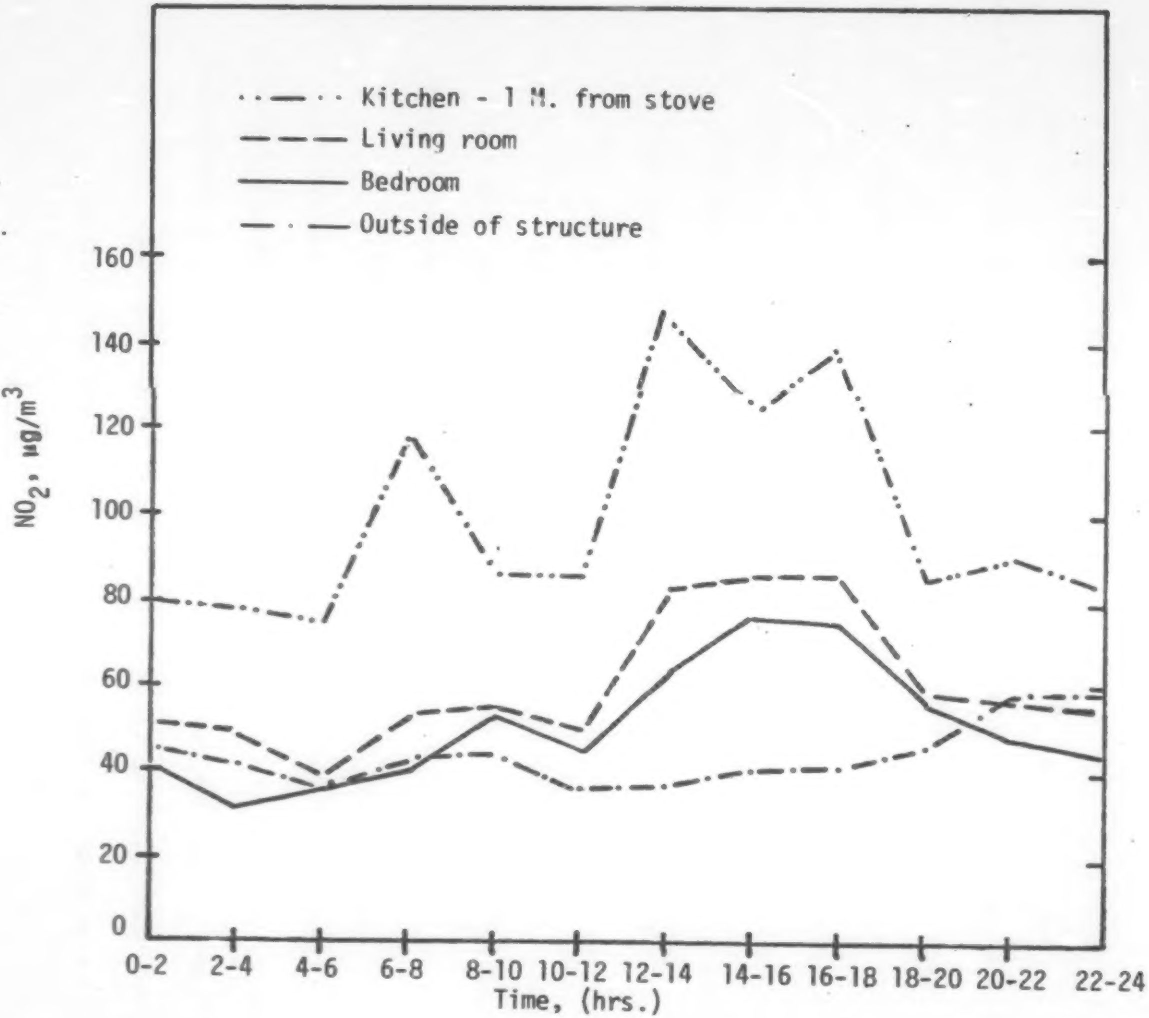


FIGURE 4-1
Diurnal Indoor/Outdoor Pattern for NO_2 - House No. 1, Spring-Summer 1973
(Composite day based on 6 days of data)

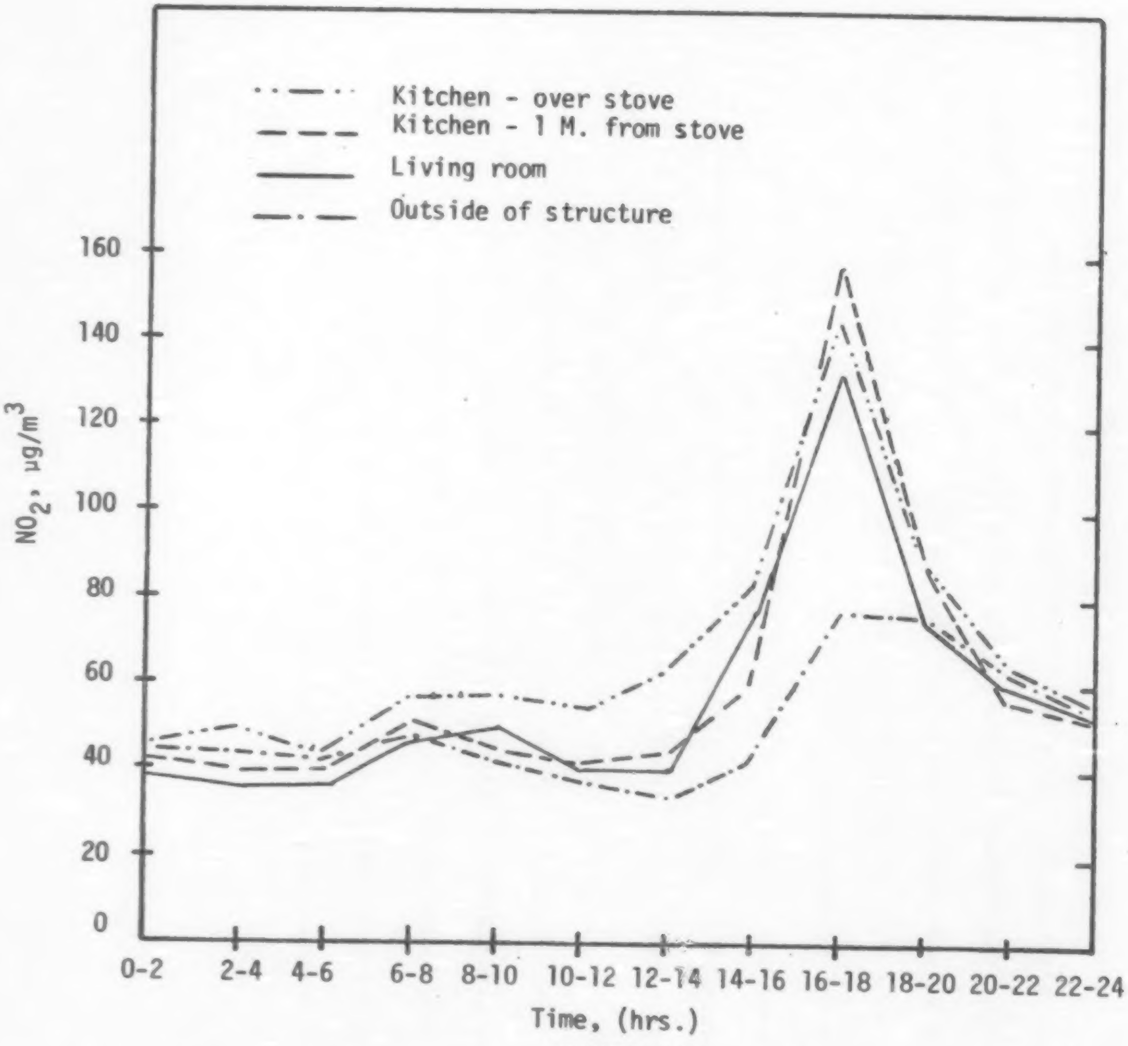


FIGURE 4-2
Diurnal Indoor/Outdoor Pattern for NO_2 - House No. 1, Fall 1973 (first half)
(Composite day based on 7 days of data)

Figure 4-3 is a time history of a 4-day period during the spring sampling at House No. 1, showing NO_2 concentrations based on two-hour average values together with data on stove use. This graph shows the immediate response of the kitchen NO_2 levels to stove use. NO_2 levels elsewhere indoors also respond quickly to stove use. Analysis of the two-hour average NO_2 data shows that the greatest effect on indoor NO_2 concentrations is caused by the oven.

Figure 4-4, a graph of the two-hour average NO_2 concentrations during a two-day period in the fall, further illustrates the effect of stove use on the indoor air quality. As with the spring sampling period, the oven creates the highest two-hour average NO_2 levels. When only the burners on the stove were used, the average NO_2 concentrations were noticeably less.

Note that on two occasions the 2-hour average NO_2 level at Station 2 (living room) exceeded one or both of the kitchen values. While part of this is doubtless the effect of entrapment of NO_2 within a relatively tightly closed house, this apparent anomaly may have been caused in part by the sequential nature of our sampling method. If the stove is turned on just before Station 2 (living room) is sampled, this station will respond rapidly to stove contributions. If the stove is turned off within the 10-minute period before Station 1 (kitchen over stove) is sampled, the level of NO_2 in the kitchen could drop below the earlier level in the living room.

A cursory examination of Figure 4-4 might give the impression that outdoor concentrations are influenced by indoor generation. This is not

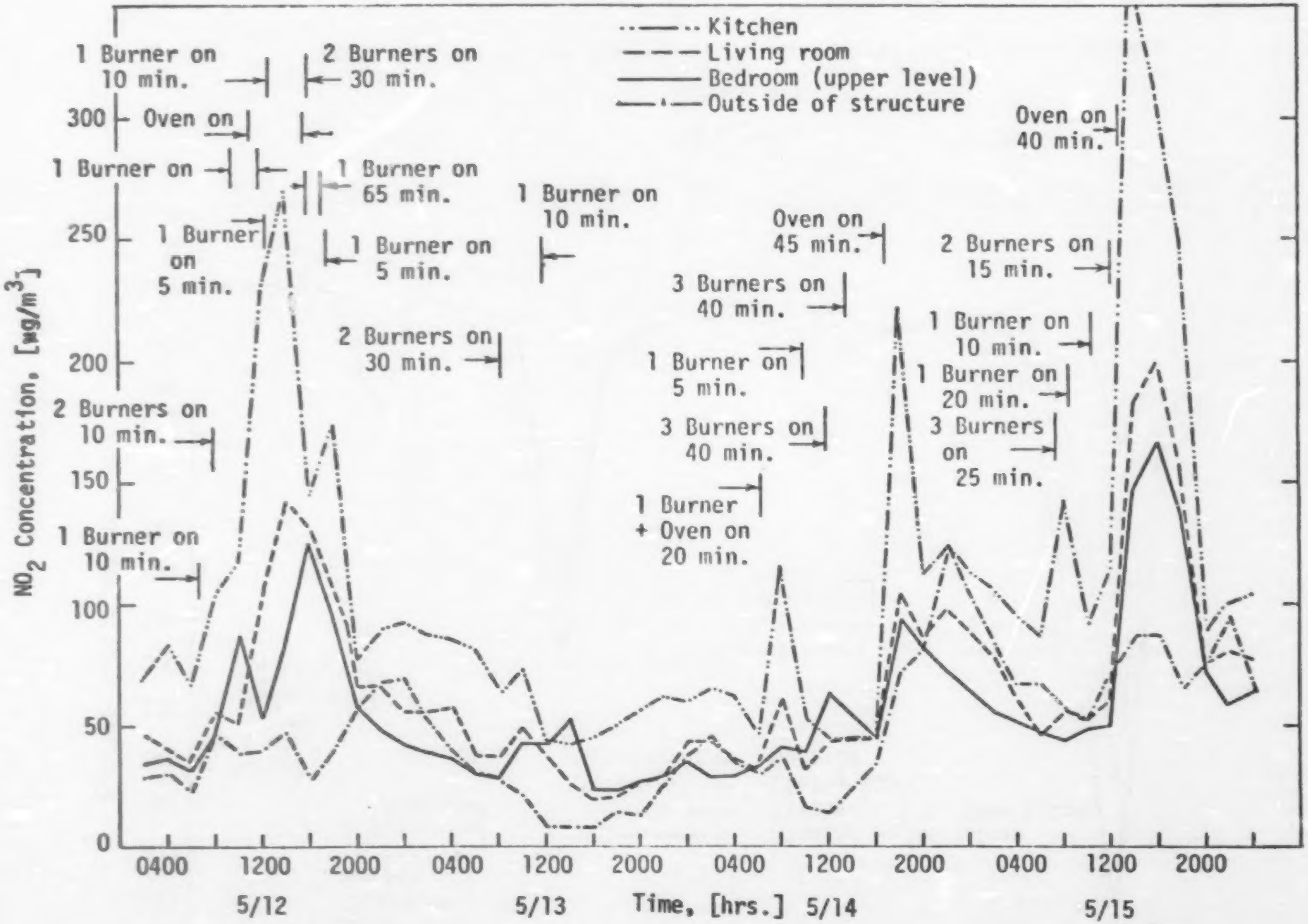


FIGURE 4-3

House No. 1 - A Time History of NO_2 Concentrations, 2-Hour Averages

Spring, 1973

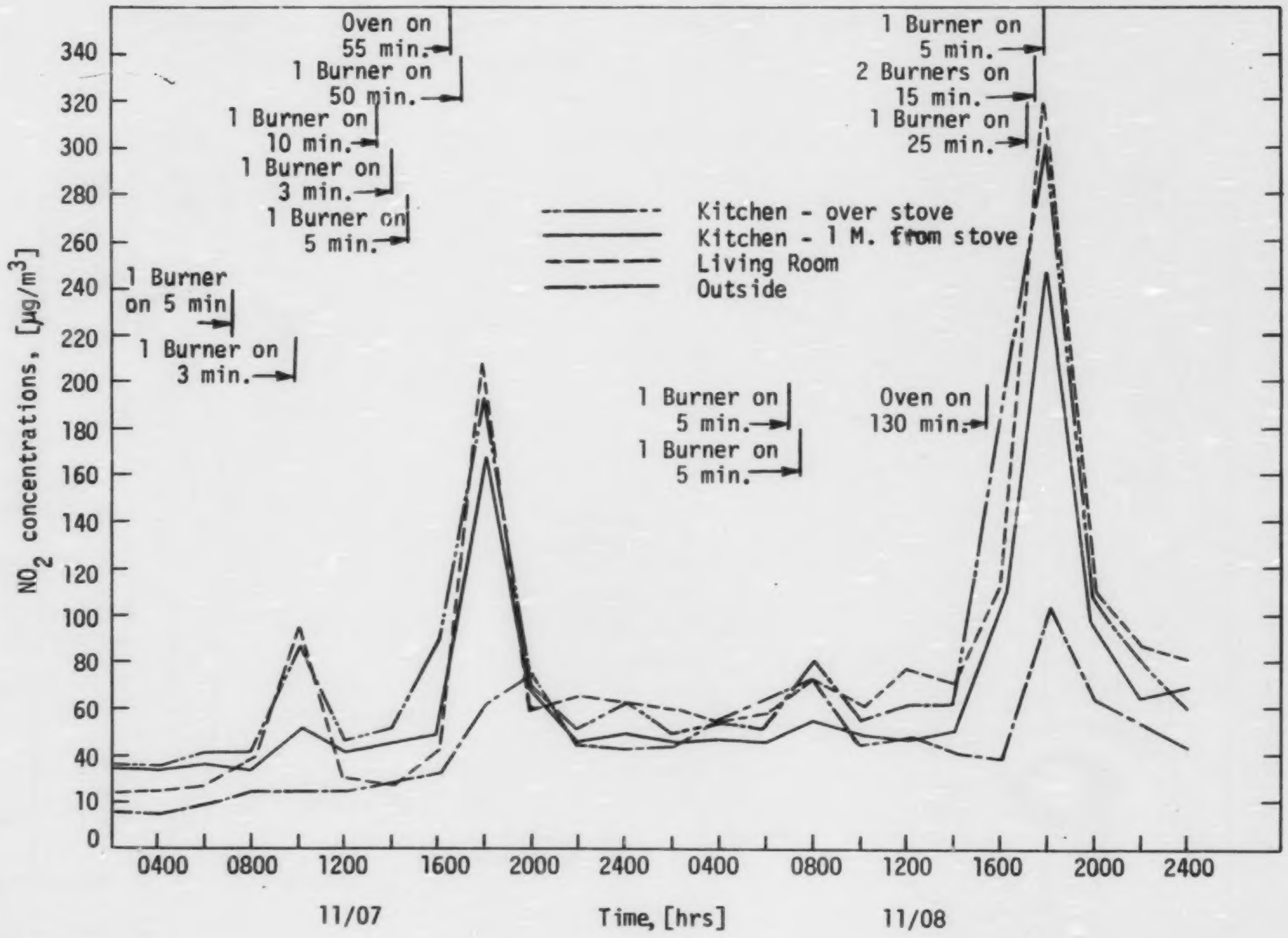


FIGURE 4-4

House No. 1 - A Time History of NO$_2$ Concentrations, 2-Hour Averages
Fall, 1973

the case, but the converse is true. Outdoor NO_2 levels reached peak values at approximately the same times of day during both the summer and the fall sampling periods. These peaks are associated with the time periods of greatest traffic activity on nearby roads and are frequently coincident with times of meal preparation at this house.

During inactive periods, NO_2 concentrations were close to but slightly greater than the outdoor NO_2 levels. This difference is attributable to the pilot lights. Our laboratory study (Task 1) showed that the pilot lights consume approximately 0.5 cubic feet(.014 cu M) of natural gas per hour.

A frequency distribution of all the five-minute NO_2 data acquired from House No. 1 was prepared to show the relative occurrence of various NO_2 levels within this structure. Figure 4-5 is a log-probability graph of the NO_2 frequency distribution for all five-minute data at each of the four sampling locations for the spring sampling period.

The graph shows that for any chosen percent of data less than a given value, the sampling locations were arranged high to low in the same order: kitchen, living room, bedroom, and outside, the expected pattern. Although displaced in terms of concentration in the aforementioned order, the three indoor locations have essentially parallel distributions up to the 90% level. The living room and upper bedroom data are parallel through their entire length but the kitchen has a noticeably divergence from this general trend at the 90% level. This noticeable effect of indoor generation on the distribution of NO_2 concentrations measured in the kitchen was not as evident in the data for the other indoor locations.

Figure 4-5 clearly shows that the NO_2 concentrations measured indoors have a distribution quite distinct from the outdoor data. The kitchen particularly reflects the influence of internal generation of NO_2 by the stove with a significant number of observations above 100 $\mu g/m^3$.

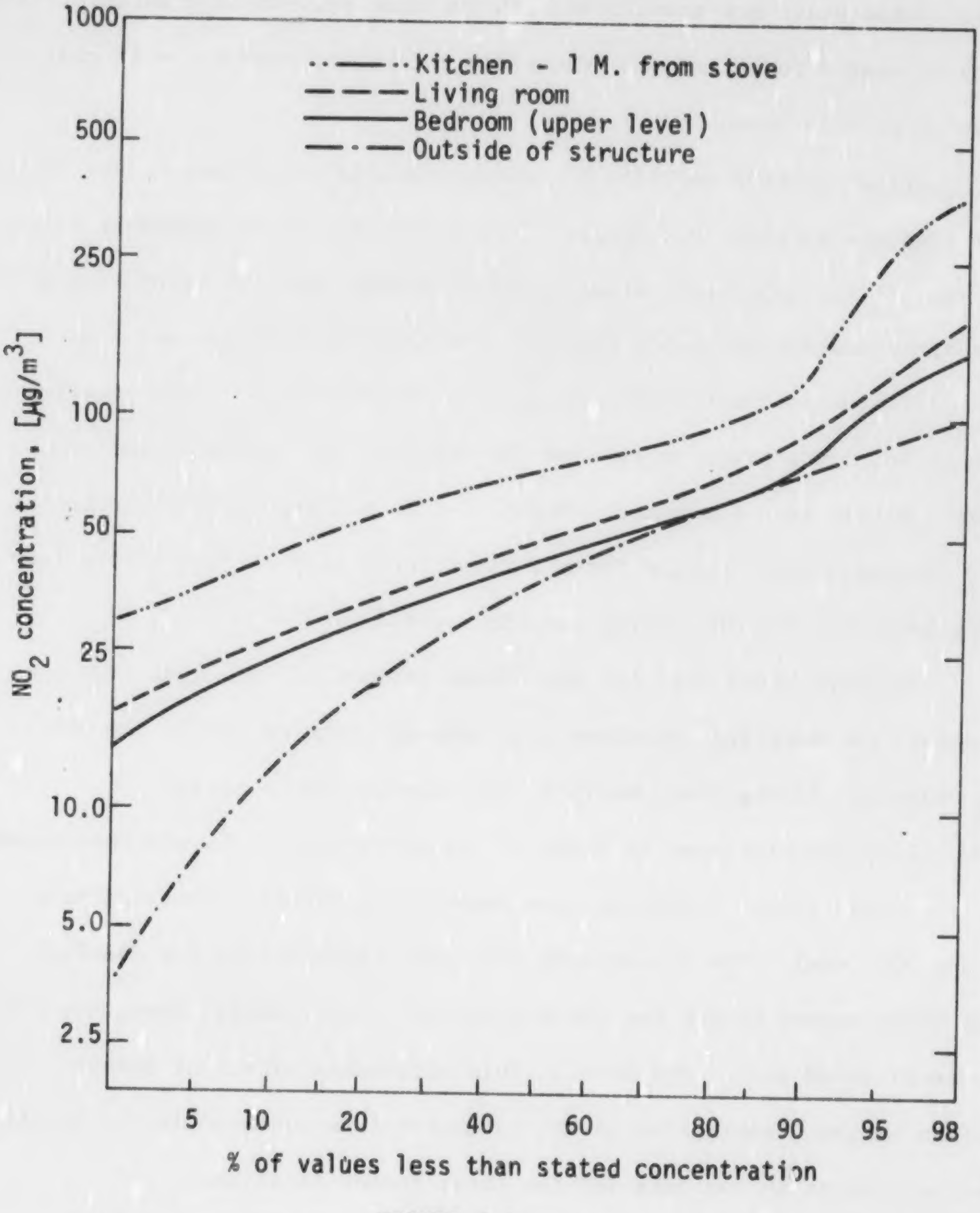


FIGURE 4-5

House No. 1 - Frequency Distribution of NO_2 Concentrations, Five-minute Data

Spring, 1973

We use 100 $\mu g/m^3$ as a basis for comparing the frequency distribution of NO_2 concentrations at various points in the house since this is the outdoor air quality standard. While we are dealing with the indoor inhabited atmosphere for which there is as yet no air quality standard, it is still part of the total human exposure and use of an adopted outdoor standard based on human health effects as a guideline for exposure seems appropriate at this time. If greater than 50% of the values at a given sampling point are above 100 $\mu g/m^3$, it is conceivable that the arithmetic average of the 5-minute data would exceed 100 $\mu g/m^3$. If these data are typical of long term occurrences, they would then be considered to be reasonably representative of long term (annual) exposures.

NO_2 levels in excess of 100 $\mu g/m^3$ occurred in 16% of the data from the kitchen, 9% of the data from the living room and 6% of the data from the upper-level bedroom. Except for a few isolated instances, no data in excess of 100 $\mu g/m^3$ were collected from Station 4, outside House No. 1

The frequency distribution of the NO_2 data for the fall sampling period at House No. 1 was separated into two sub-periods, one for the time when Station 2 was located in the living room (first half of sampling period), and the other for Station 3 in the bedroom (second half of sampling period). The results for the two sub-periods are shown in Figures 4-6 and 4-7 respectively. With Station 2 in the living room (Figure 4-6), the NO_2 distribution curves for each of the locations are quite similar and in fact intertwine with each other in many instances. These distributed data do not shown the clear cut separation as appeared in the spring sampling period.

Approximately 10 percent of the indoor data from all three locations was in excess of 100 $\mu g/m^3$, which is less for Station 1 and slightly more for Stations 1A & 2 than was shown in the summer. As mentioned earlier, this is primarily due to the lower level of stove activity during the fall as compared with the spring. The relatively larger quantity of concentration readings greater than 100 $\mu g/m^3$ at the other indoor locations and the close relationship of the indoor concentration distributions, again, appear to show

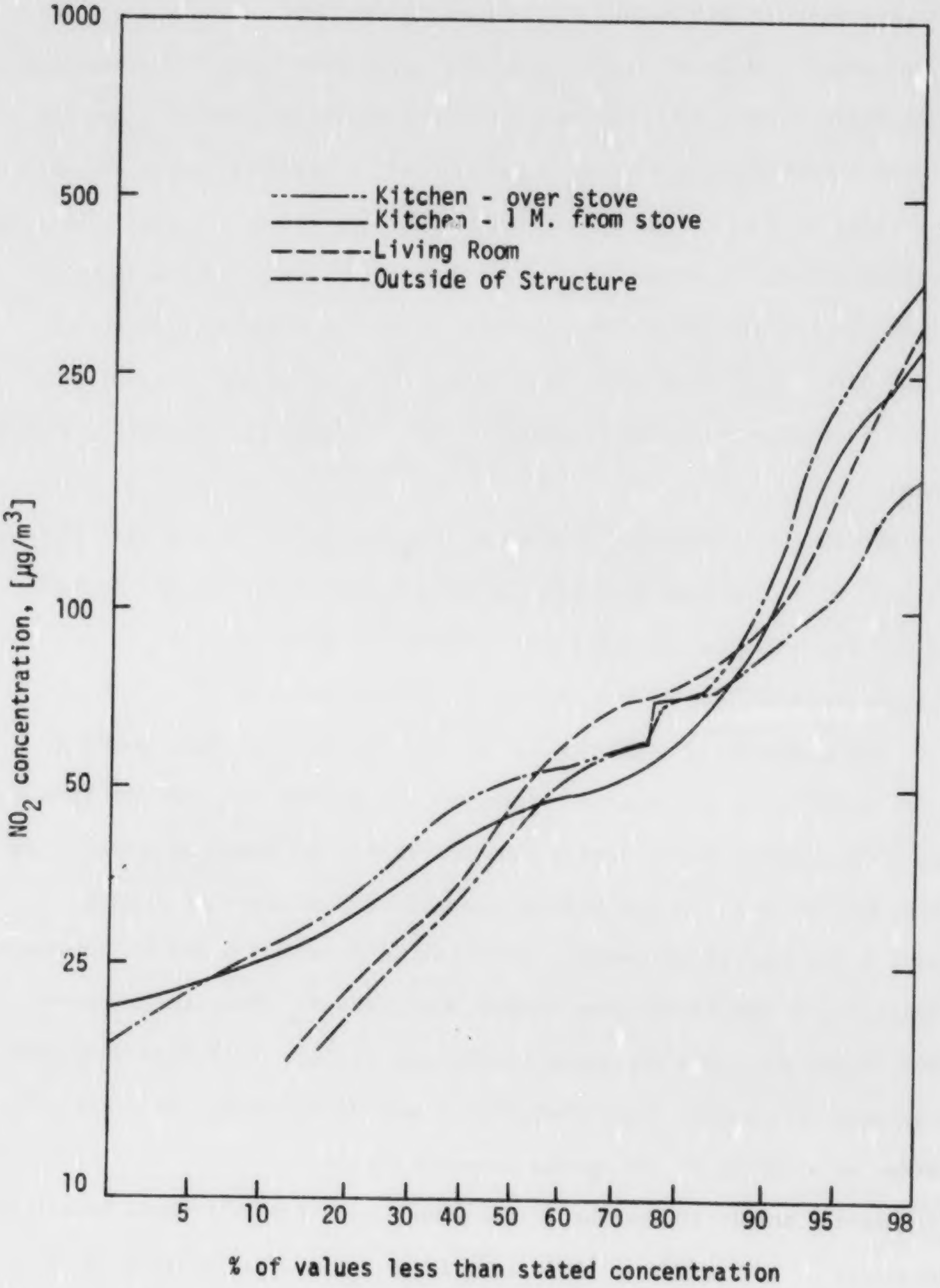


FIGURE 4-6
House No. 1 - Frequency Distribution of NO$_2$ Concentrations, Five-minute Data
Fall, 1973, 1st half of period.

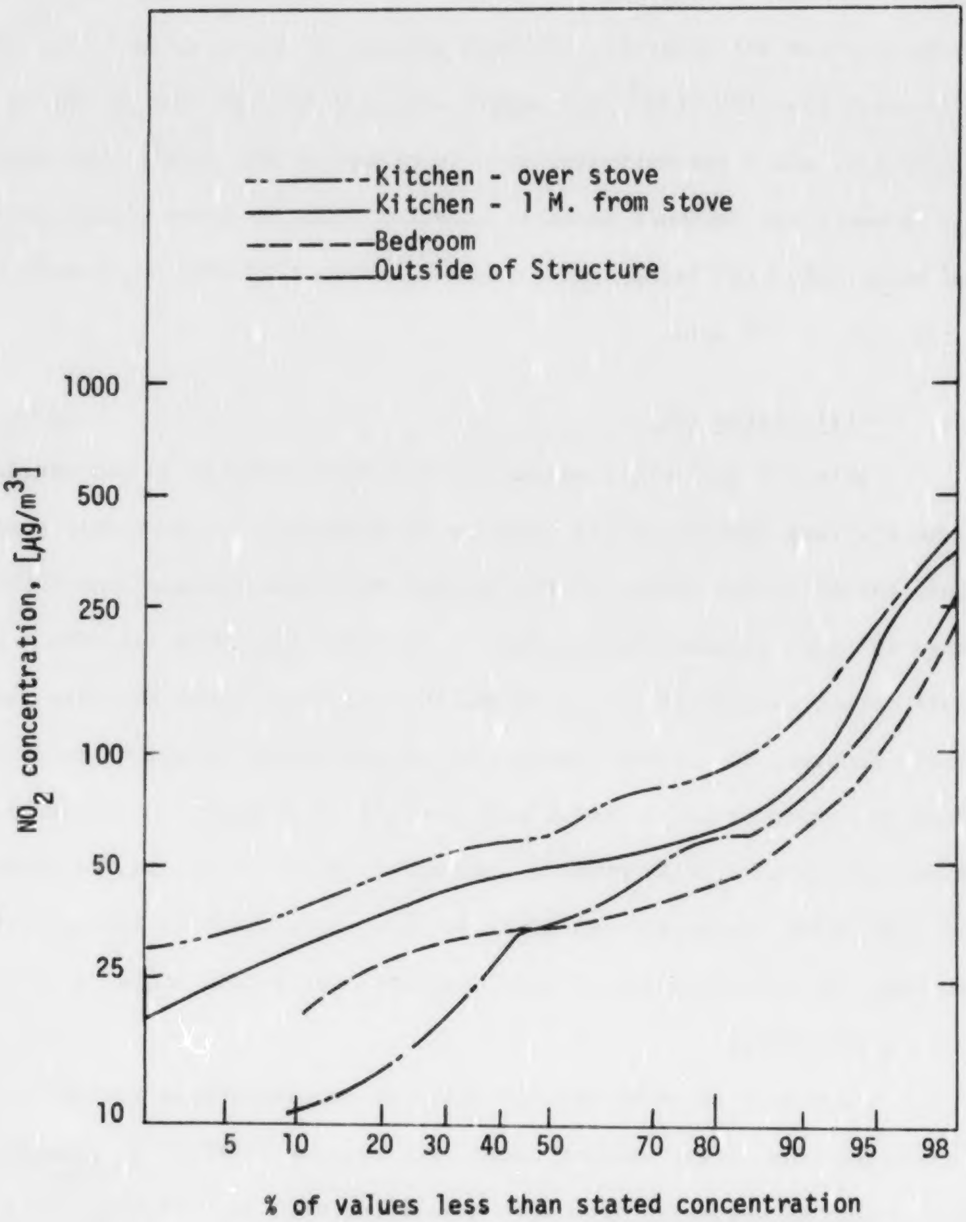


FIGURE 4-7

House No. 1 - Frequency Distribution of NO_2 Concentrations, Five-minute Data Fall, 1973, 2nd half of period.

weather.

The frequency distribution of NO_2 data with Station 3 in the bedroom, (Figure 4-7) shows a more distinct separation of the NO_2 levels in the kitchen from the bedroom and outdoors. Fifteen percent of the station #1 concentrations were greater than 100 $\mu g/m^3$, and eight, six, and five percent of the data from Stations 2,3, and 4 respectively, were in excess of 100 $\mu g/m^3$. The upper level bedroom, the farthest possible location from the stove within this house, shows relatively high independence from the outdoor ambient NO_2 levels through the top 50% of the data.

4.1.2 Nitric Oxide (NO)

Table 4-4 presents a summary of the daily average NO concentrations for the six full days of spring sampling at House No. 1. Over this sampling period, the NO concentration in the kitchen was approximately four times the average NO level outside the structure. In comparing Table 4-4 with 4-1, the overall indoor concentrations of NO and NO_2 are about equal for this sampling period. However, the overall outdoor NO_2 concentration is almost twice the outdoor NO concentration. While most sources of nitrogen oxides generate much more NO than NO_2 with eventual conversion of NO to NO_2 in the atmosphere, TRC's laboratory investigations of stove operations (Task 1) indicate that the NO and NO_2 are formed in nearly equal amounts over a wide range of stove operating conditions.

Comparison of stove use and daily NO concentrations yeilds about the same correlations as was earlier noted with respect to NO_2. In general, the highest daily NO concentrations were associated with days of high stove usage.

Table 4-5 shows a summary of the daily average NO concentrations for the fall sampling period at House No. 1. Overall, the NO concentrations during the fall were substantially greater both indoors and outside during the fall than they were in the spring. The outside NO concentration was more than twice as high as that measured in the spring. Conservation of NO within the kitchen was more apparent than for NO_2.

TABLE 4-4

Spring (1973) Sampling at House No. 1

DAILY AVERAGE NO CONCENTRATIONS AND STOVE USAGE DATA

Date	Daily Average NO Concentration, (μg/m^3)				Total Stove Use (min)	
	1-Kitchen 1 Meter from stove	2-Living Room	3-Upper Bedroom	4-Outside	Oven	Burner
5/12/73	112	65	57	18	195	335
5/13/73	47	22	28	12	0	50
5/15/73	175	132	145	37	220	195
5/22/73	66	30	20	16	20	75
5/23/73	142	101	106	66	45	80
5/24/73	72	34	31	9	40	60
OVERALL DAILY AVERAGE	102	64	65	26		

TABLE 4-5

Fall (1973) Sampling at House No. 1

DAILY AVERAGE NO CONCENTRATIONS AND STOVE USAGE DATA

Date	Daily Average NO Concentration, $\mu g/m^3$					Total Stove Use Min. *	
	1-Kitchen Above Stove	1A-Kitchen 1M from Stove	2-Living Room	3-Bedroom	4-Outside	Oven	Burner
11/07/73	91	75	73		22	55	76
11/08/73	207	191	160		90	130	62
11/10/73	21	20	12		14	0	21
11/11/73	126	130	60		46	165	113
11/12/73	184	190	128		112	70	59
11/13/73	215	219	140		100	70	98
11/14/73	109	113	88		59	0	20
OVERALL DAILY AVERAGE	136	134	94		63		
11/15/73	141	138		112	99		
11/16/73	66	73		55	22		
11/17/73	71	76		43	15		
11/18/73	65	65		46	21		
11/19/73	228	195		147	60		
11/20/73	235	241		209	171		
OVERALL DAILY AVERAGE	134	131		102	65		

* Stove use data not available during second half of period.

The effect of ambient outdoor NO levels on the indoor NO concentration is somewhat different than appeared with the NO_2. In Table 4-5 we see that two days of similar stove activity, 7 November and 12 November, had substantially different NO levels outdoors and subsequently, indoors as well. Outdoor NO levels on 12 November averaged 5 times those recorded on 7 November. On each of these days, NO levels at Station 1 were approximately 70 $\mu g/m^3$ higher than ambient levels outdoors on the same day. The direct influence is dampened somewhat by the relatively isolated indoor environment caused by closed doors and windows during the colder season.

Table 4-6 is organized similarly to Table 4-3 for NO_2 and is based on averages for entire sampling periods. In comparing Table 4-6 with Table 4-3, one is struck with the extreme complexity of the indoor/outdoor patterns of NO and NO_2. Thus, interpretations must be made largely on the basis of experienced judgment together with data which appear to show some trends. The principal variables which affect indoor patterns of NO and NO_2 are:

1. Stove use
2. Permeability of the house (higher in spring than in fall)
3. Indoor/outdoor ratio
4. Loss of pollutant through reaction, adsorption, and other mechanisms

In Table 4-3, note that outdoor concentrations of NO_2 are about the same for spring and fall, but fall concentrations of NO as shown in Table 4-6 are more than twice the average for the spring. While an analysis of the meteorology and the details of outdoor air quality are outside the scope of this program, we presume that the warmer weather, higher incidence of sunlight

TABLE 4-6

SUMMARY OF AVERAGE NO VALUES AND STOVE USE

House No. 1 - Spring and Fall Sampling, 1973

Season and Data Category	Sampling Location					Average Stove Use (min/day) *		
	Kitchen above stove	Kitchen 1 Meter from stove	Living Room	Bedroom	Outside	Oven	Burner	Total
Spring, 1973						87	133	220
NO Concentration, μg/m^3	--	102	64	65	26			
% of remote kitchen value	--	100	63	60	--			
Indoor/Outdoor ratio	--	3.92	2.46	2.50	1.00			
Fall, 1973(first half)						70	64	134
NO Concentration, μg/m^3	136	134	94	--	63			
% of max. kitchen value	100	99	69	--	--			
% of remote kitchen value		100	70	--	--			
Indoor/Outdoor ratio	2.16	2.13	1.49	--	1.00			
Fall, 1973(second half)								
NO Concentration, μg/m^3	134	131		102	65			
% of Max Kitchen Value	100	98		76	--			
% of Remote Kitchen Value		100		78				
Indoor/Outdoor Ratio	2.06	2.02		1.57	1.00			

* Stove use data not available during second half of Fall period.

and photochemical processes contributed to the more complete conversion of NO to NO_2 in the spring as compared with the fall.

In comparing the "percent" of remote kitchen value" for NO in the spring and fall in Table 4-6, there is a drop to 63% in the spring and 70% in the fall. This is presumed to be the joint effect of higher house permeability in the spring and higher outdoor NO levels in the fall.

A graph of the two-hour average NO concentrations versus time for the same time period in the spring as shown earlier for NO_2 (Figure 4-3) is presented in Figure 4-8. Comparison of the two figures (4-3 and 4-8) shows them to be basically similar with common peaks and analogous traces. Stove use readily affected the indoor NO levels and the behaviour of the NO with time and distance from the source was the same during both periods.

We do not present a typical time history for NO during the fall since such a graph would not add significantly to our basic knowledge.

Comparison of NO and NO_2 two-hour averaged data in addition to the graphical data also shows that the total oxides of nitrogen (NO and NO_2) did not remain constant during and after stove operation but increased and declined with stove use. This observation is evidence that the generation and diffusion of NO_2 rather than conversion of NO to NO_2 is the predominant source of indoor NO_2. The conversion of NO to NO_2 by reaction with atmospheric oxygen is inhibited by the lack of sunlight available inside the house to promote that reaction.

A frequency distribution of the five-minute average NO data obtained during the spring sampling period at House No. 1 is shown in Figure 4-9. The NO concentrations measured in the kitchen ranged from 4 $\mu g/m^3$ to 500 $\mu g/m^3$. Although the distribtuions of NO and NO_2 concentrations in the spring are somewhat similar, one notable difference between the two sets of data is the uniform

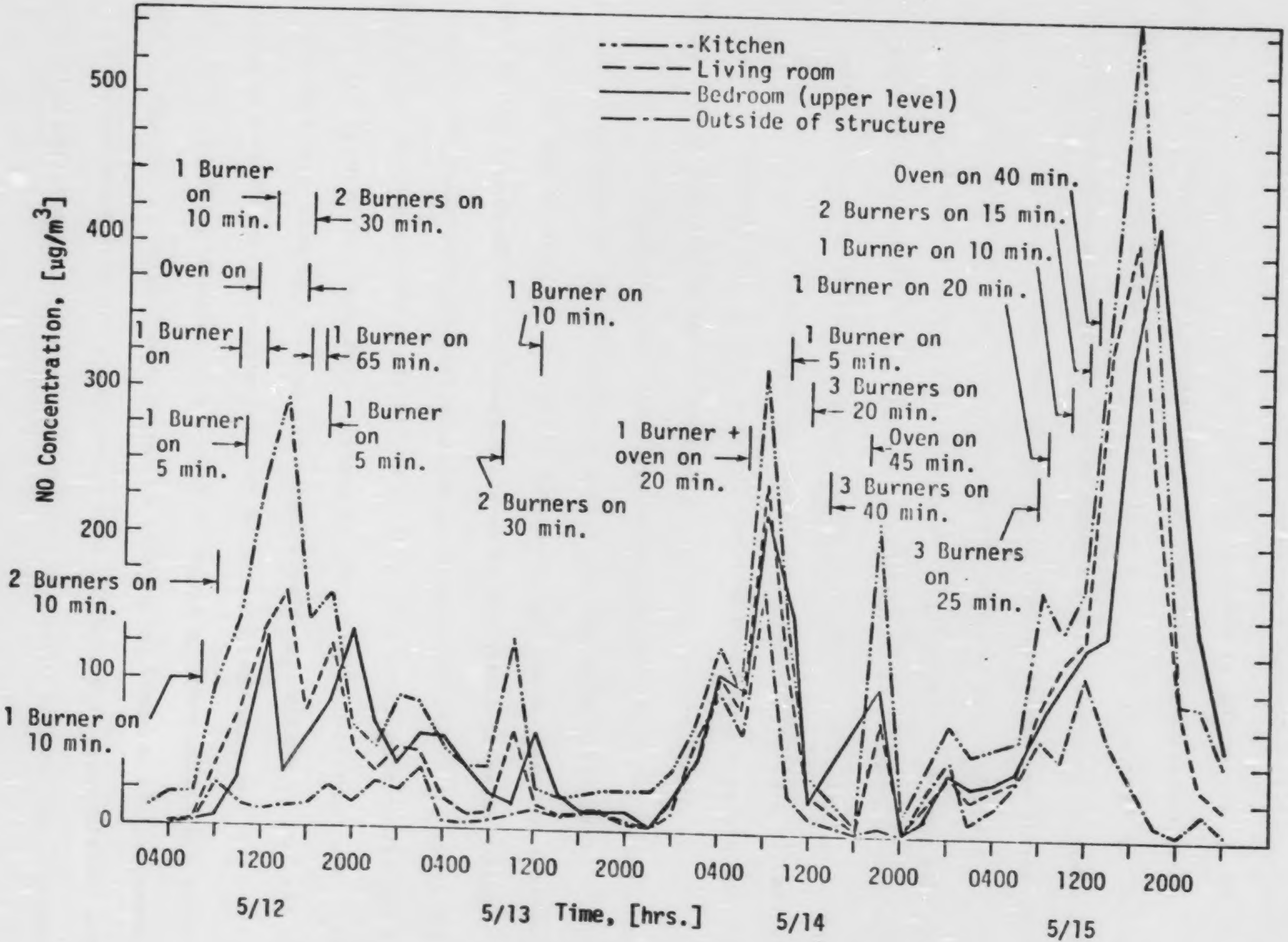


FIGURE 4-8

House No. 1 - A Time History of NO Concentrations, 2-Hour Averages
Spring, 1973

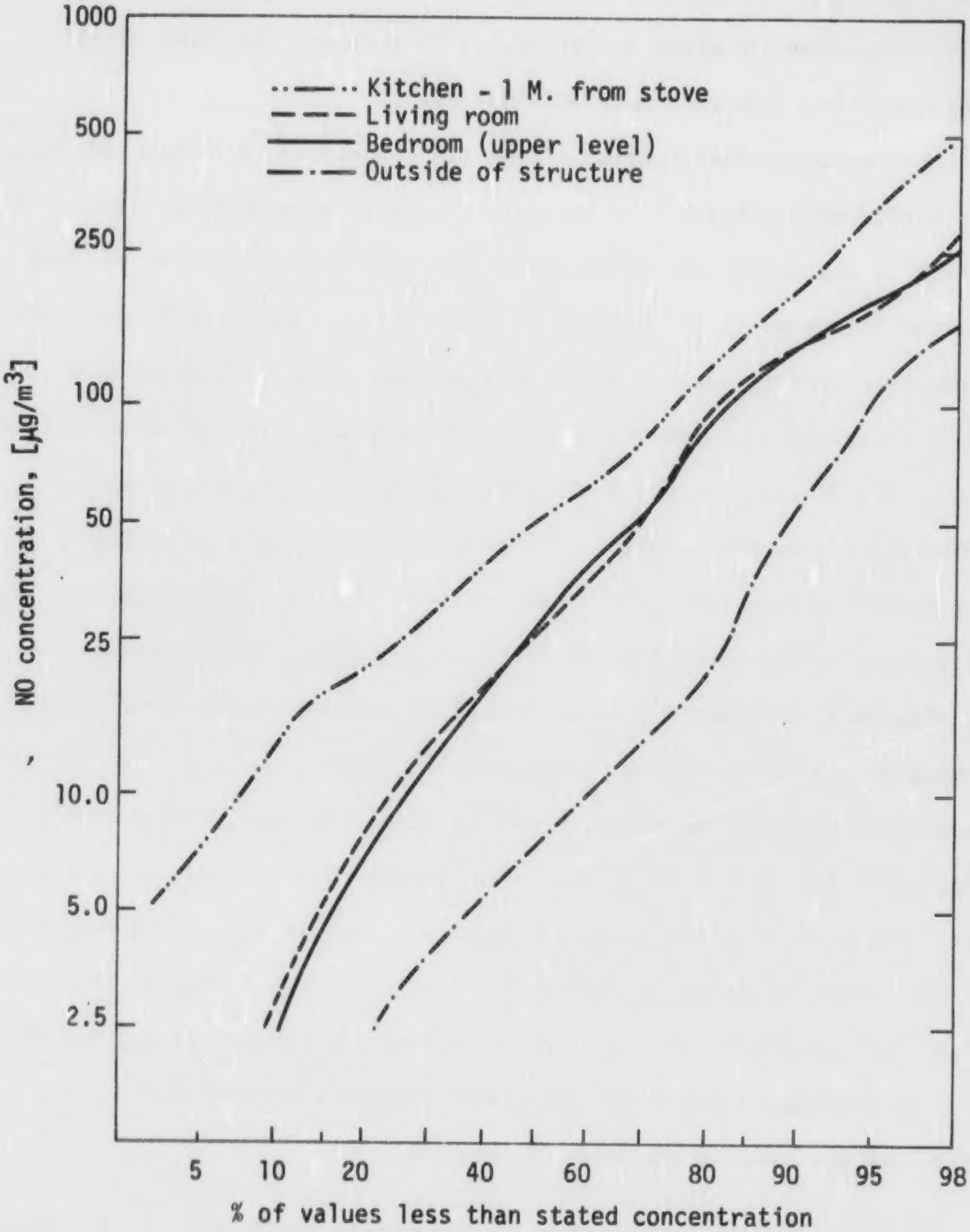


FIGURE 4-9

House No. 1 - Frequency Distribution of NO Concentrations, Five-minute Data
Spring, 1973

distribution of the kitchen NO data compared to the abrupt increase in NO_2 levels at high concentrations. This observation may be explained by our results from laboratory study of stove operations which indicate that some stove operating conditions generate more NO_2 than NO.

The frequency distribution of the five-minute NO data from the fall sampling period with Station 2 in the living room is presented in Figure 4-10. Figure 4-11 is a graph of the frequency distribution of five-minute NO data with Station 3 located in the bedroom of House No. 1. Figure 4-10 shows the very close relationship between Stations 1 and 1A. Nitric oxide is shown as relatively inert and is conserved well in its diffusion into the kitchen from the stove. The living room has a distinctly lower occurrence of a specific NO concentration than the kitchen. All of the indoor locations in both sampling periods showed higher NO concentrations than occurred outdoors. The frequency distribution presenting NO data when Station 3 was located in the bedroom (Figure 4-11) shows the three indoor locations as more closely related than during the earlier sampling. Approximately 60% of the indoor NO concentrations were less than 100 $\mu g/m^3$ during this week of sampling.* The earlier week's sampling, with Station 2 in the living room (Figure 4-10) showed NO concentrations less than 100 $\mu g/m^3$ only 40% to 60% of the time. During the spring sampling period, the indoor NO levels were less than 100 $\mu g/m^3$ for 70-80% of the time. Generally, the occurrence of higher NO concentrations indoors during the fall is caused by the higher background NO levels present outdoors and the more tightly closed attitude of the house in the fall.

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*The 100 $\mu g/m^3$ is not significant for NO since there is no ambient air quality standard for this pollutant. However, it is convenient to use this concentration as a basis for comparison since it is the ambient air quality standard for NO_2 (annual average) and NO and NO_2 and generated together in gas flames.

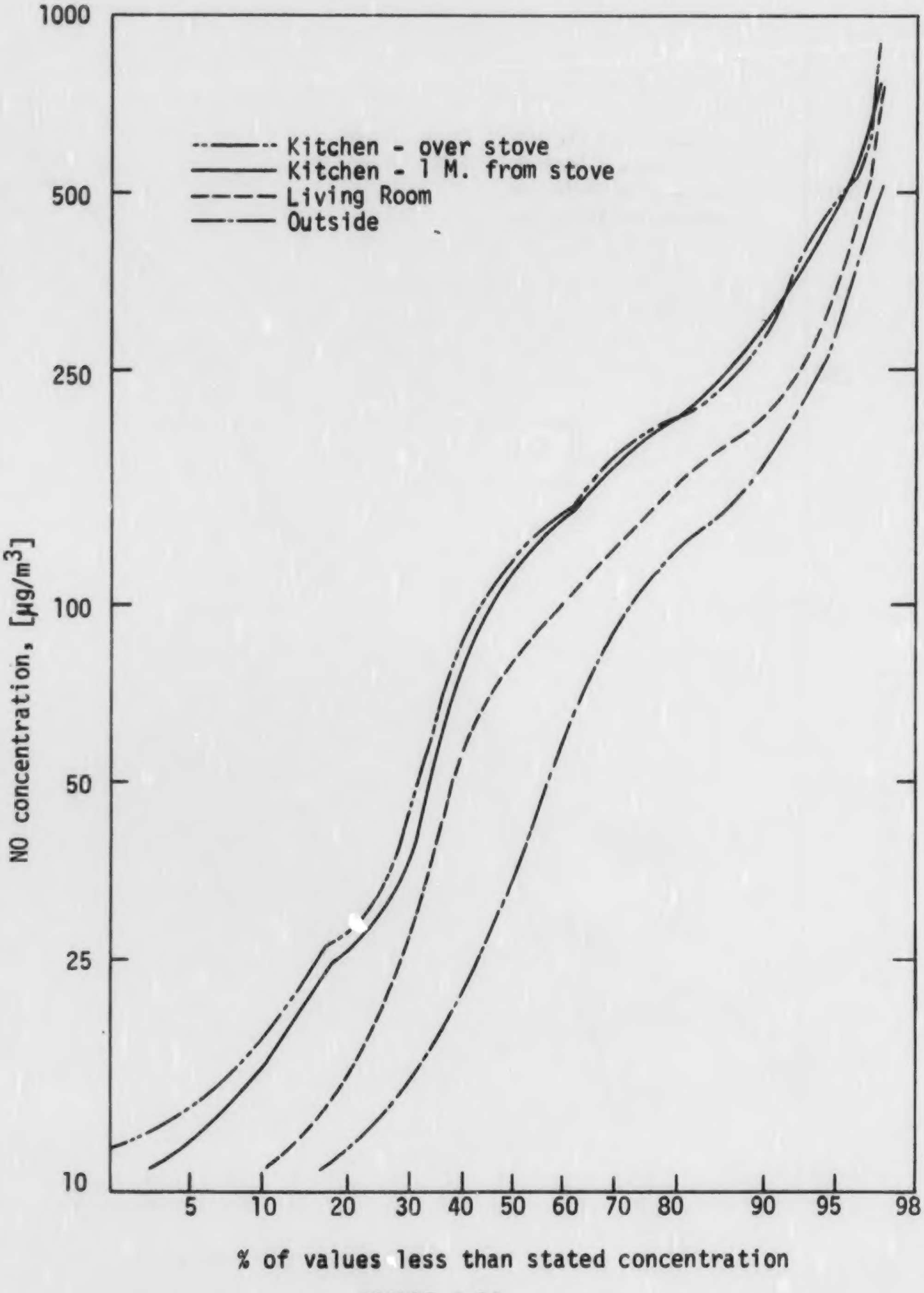

FIGURE 4-10

House No. 1 - Frequency Distribution of NO Concentrations, Five-minute Data
Fall, 1973, 1st half of period

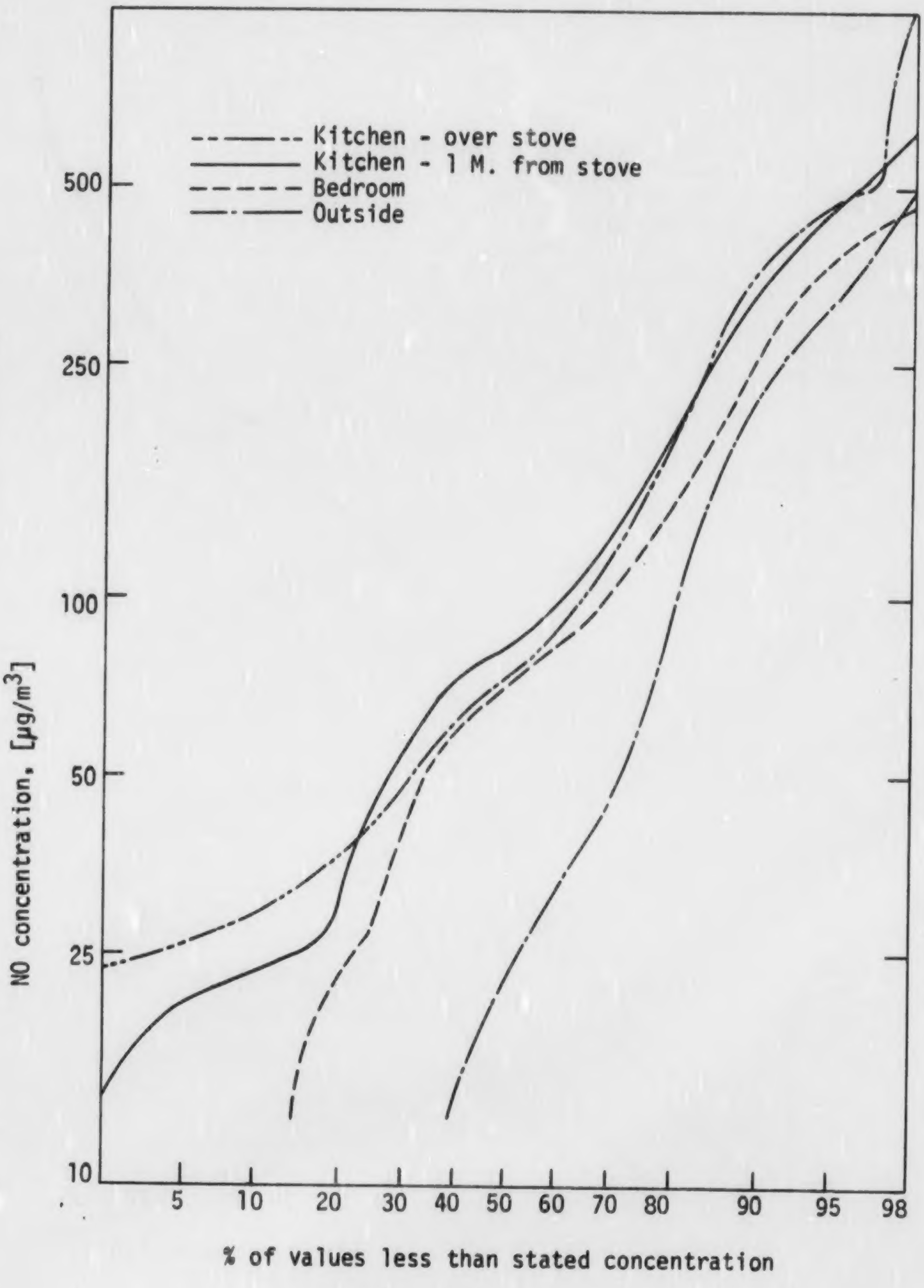

FIGURE 4-11

House No. 1 - Frequency Distribution of NO Concentrations, Five-minute Data

Fall, 1973, 2nd half of period

4.1.3 Carbon Monoxide (CO)

The daily average carbon monoxide levels for the spring sampling period at House No. 1 are compiled in Table 4-7. Over the entire spring sampling period at House No. 1, the daily average carbon monoxide concentration in the kitchen was approximately 1.3 times greater than the daily average CO concentration outside the structure. This is considerably less than the ratio between kitchen and outdoor concentrations for NO_2 and NO. (2.3 and 3.9 respectively for the same period)

An examination of the two-hour time averaged data contained in Appendix B-1 also shows that the CO generated within the house was not as widespread as were the two oxides of nitrogen. The carbon monoxide levels generally did not increase at rates similar to NO and NO_2 and in some cases did not reach peak levels until after the stove was shut off. The rates of increase of CO concentrations in the living room and bedroom were similar to the rate of increase in the kitchen.

Table 4-8 is a summary of the daily average CO concentrations at House No. 1 during the fall sampling period. In spite of a considerably lower level of stove activity during the first half of this sampling period, carbon monoxide levels were about the same indoors but lower outdoors when compared to the spring data. During the second half of the fall sampling period when stove use data were not available, the indoor CO levels again were similar to those in the spring but the outdoor levels were lower. CO levels in the kitchen average 2.5 times greater than outdoors during the first part of the fall sampling period. Stations 1 and 1A showed a similarity in average CO levels that were comparable to those measured for NO, with Station 1A averaging concentrations that were 84% and 88% of those measured directly over the stove for the first and second halves of the fall period. As demonstrated with NO_2 and NO, the indoor CO levels at various indoor locations were much

TABLE 4-7

Spring (1973) Sampling at House No. 1

DAILY AVERAGE CO CONCENTRATION AND STOVE USAGE DATA

Date	Daily Average CO Concentration, (μg/m^3)				Total Stove Use (Min)	
	1-Kitchen(1M From Stove)	2-Living Room	3-Upper Bedroom	4-Outside	Oven	Burner
5/12/73	6430	5800	5920	5080	195	335
5/13/73	8980	8680	8980	8230	0	50
5/14/73	5650	5430	5610	5070	130	85
5/15/73	5660	5150	5430	4060	220	195
5/16/73	3280	2720	2840	2240	15	165
5/21/73	3070	2630	2600	2100	20	50
5/22/73	1400	1120	1020	970	20	75
5/23/73	3190	2750	2840	1930	45	80
5/24/73	2770	2360	2330	1660	40	60
OVERALL DAILY AVERAGE	4490	4070	4170	3480		

TABLE 4-8

Fall (1973) Sampling at House No. 1

DAILY AVERAGE CO CONCENTRATIONS AND STOVE USAGE DATA

Date	Daily Average CO Concentration, $\mu g/m^3$					Total Stove Use, Min *	
	1-Kitchen Above Stove	1A-Kitchen 1 M from Stove	2-Living Room	3-Bedroom	4-Outside	Oven	Burner
11/07/73	4670	3800	3570		1800	55	76
11/08/73	6130	5330	4800		2530	130	62
11/09/73	3240	2870	2580		1200	0	82
11/10/73	2730	2080	1960		1140	0	21
OVERALL DAILY AVERAGE	4190	3520	3230		1670		
11/15/73	5270	4730		4430	2790		
11/16/73	3920	3480		2850	1560		
11/17/73	3750	3140		2800	1550		
11/18/73	4140	3550		3217	1834		
11/19/73	5082	4360		4090	2370		
11/20/73	6550	6010		5600	3760		
OVERALL DAILY AVERAGE	4790	4210		3830	2310		

*Stove use data not available for second half of period.

closer to each other during the fall than in the summer. This shows the effect of a more sealed up attitude of the house in the fall as compared with the spring.

As noted earlier, CO concentrations at House No. 1 during the fall do not appear to peak as fast as NO_2 and NO. In several cases, CO levels did not reach peak values until after the stove was shut off. The rate of increase of CO levels indoors was similar for all locations.

Table 4-9 summarizes CO concentrations and stove use data for House No. 1 for both the spring and fall sampling periods. Because of less stove use in the fall (first half of period), indoor concentrations of CO are slightly lower in the fall as compared to the spring. However, the indoor/outdoor ratio is much higher for the fall data which reflects the more tightly closed aspect of the house in the fall. Also it appears that there are other sources of indoor CO besides the stove. This house was used in the first indoor/outdoor air quality study conducted by TRC* and we found that the attached garage in this house could contribute significantly to indoor CO concentrations under certain circumstances. It is conceivable that auto exhausts entrapped in the garage, in diffusing through the house, add to the levels of indoor CO. Such an effect will be enhanced by cold weather when the warm house acts like a "stack" and can induce air from the garage at the lower level and spread it through the house.

We do not present any typical CO time histories for House No. 1 but the two-hour average data for the spring and fall are presented in Appendices B-1 and B-2 respectively.

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*See Reference (1) on page 1.

TABLE 4-9

SUMMARY OF AVERAGE CO VALUES AND STOVE USE

House No. 1 - Spring and Fall Sampling, 1973

Season and Data Category	Sampling Location					Average Stove Use (min/day)		
	Kitchen above stove	Kitchen 1 Meter from stove	Living Room	Bedroom	Outside	Oven	Burner	Total
Spring, 1973								
CO Concentration, μg/m^3	--	4490	4070	4170	3480	76	122	198
% of remote kitchen value		100	91	93	--			
Indoor/Outdoor ratio		1.29	1.17	1.20	1.00			
Fall, 1973 (first half)								
CO Concentration, μg/m^3	4190	3520	3230	--	1670	46	60	106
% of max. kitchen value	100	84	77	--	--			
% of remote kitchen value	--	100	92	--	--			
Indoor/Outdoor ratio	2.51	2.11	1.93	—	1.00			
Fall, 1973 (second half)								
CO Concentration, μg/m^3	4790	4210		3830	2310			
% of max. kitchen value	100	88		80	--			
% of remote kitchen value	—	100		91	--			
Indoor/Outdoor ratio	2.07	1.82		1.66	1.00			

* Stove use data not available for second half of fall period.

Figures 4-12, 4-13, and 4-14 are cumulative frequency distributions of the five-minute averaged CO data from House No. 1 during the spring, the fall with Station 2 in the living room, and the fall with Station 3 in the bedroom, respectively. The two distributions from the two fall periods have similar shapes, but the curves for spring measurements drop off sharply for low values. For each sampling period, the three indoor locations had very similar frequency of occurrences of specific concentrations. This illustrates the relative independence of CO concentrations from the sampling location as compared to NO_2 and NO for five-minute periods. For the fall distributions, the curves for the three indoor locations are closely grouped and there is a greater difference between the grouped indoor curves and the outdoor curve than was shown in the spring data.

4.2 House No. 2 Urban Two Story Home

4.2.1 Nitrogen Dioxide (NO_2)

Fall sampling was not carried out at this house since the amount of stove use by the single occupant was not sufficient to make an adequate evaluation.

Table 4-10 presents the daily averages of NO_2 at House No. 2. It is readily apparent that there is little difference in the concentrations measured at the four locations when averaged over a day. Outdoor NO_2 concentrations were about twice as high at House No. 2 compared to the other structures. This reflects the urban location and proximity of House No. 2 to local traffic arteries. The frequency of stove use was considerably less than for House No. 1 and this appeared to be the reason for the uniformity until we examined the two-hour averaged data.

Figure 4-15 is a graph of a portion of the two-hour averaged data included in Appendix B-3. It shows the specific influence of stove

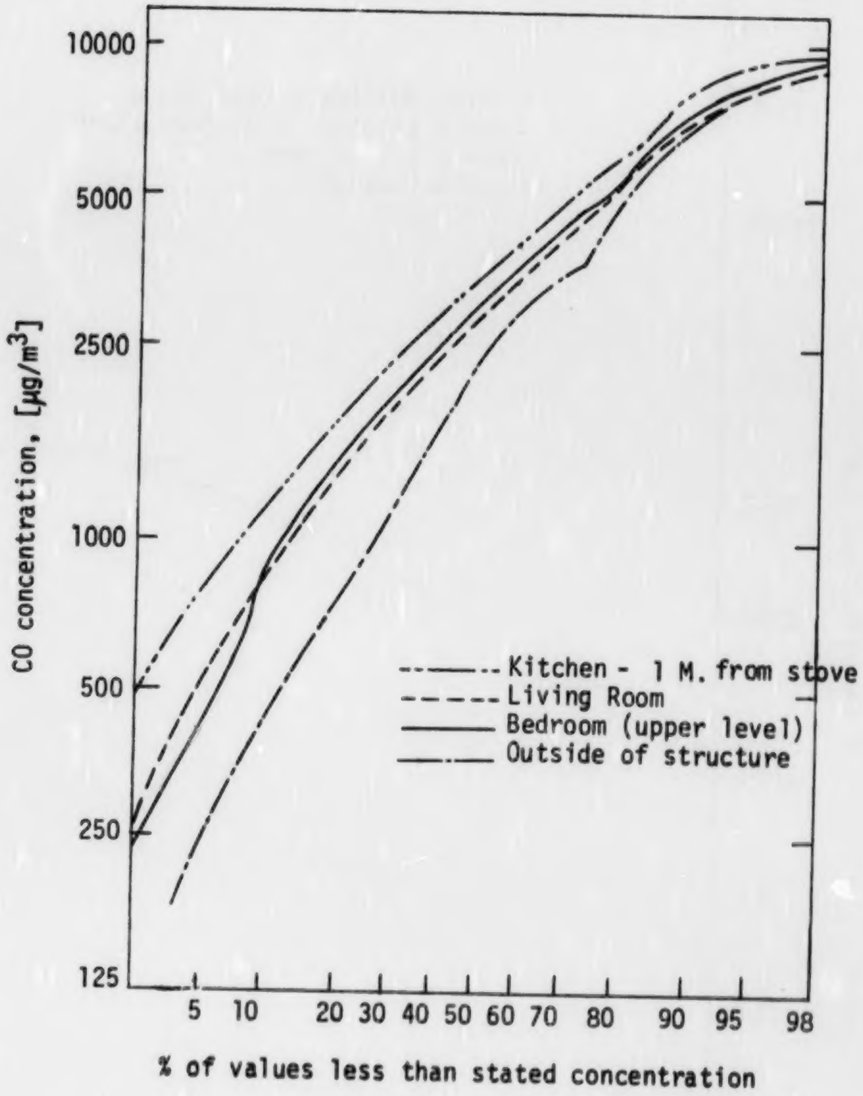

FIGURE 4-12

House No. 1 - Frequency Distribution of CO Concentrations, Five-minute Data

Spring, 1973

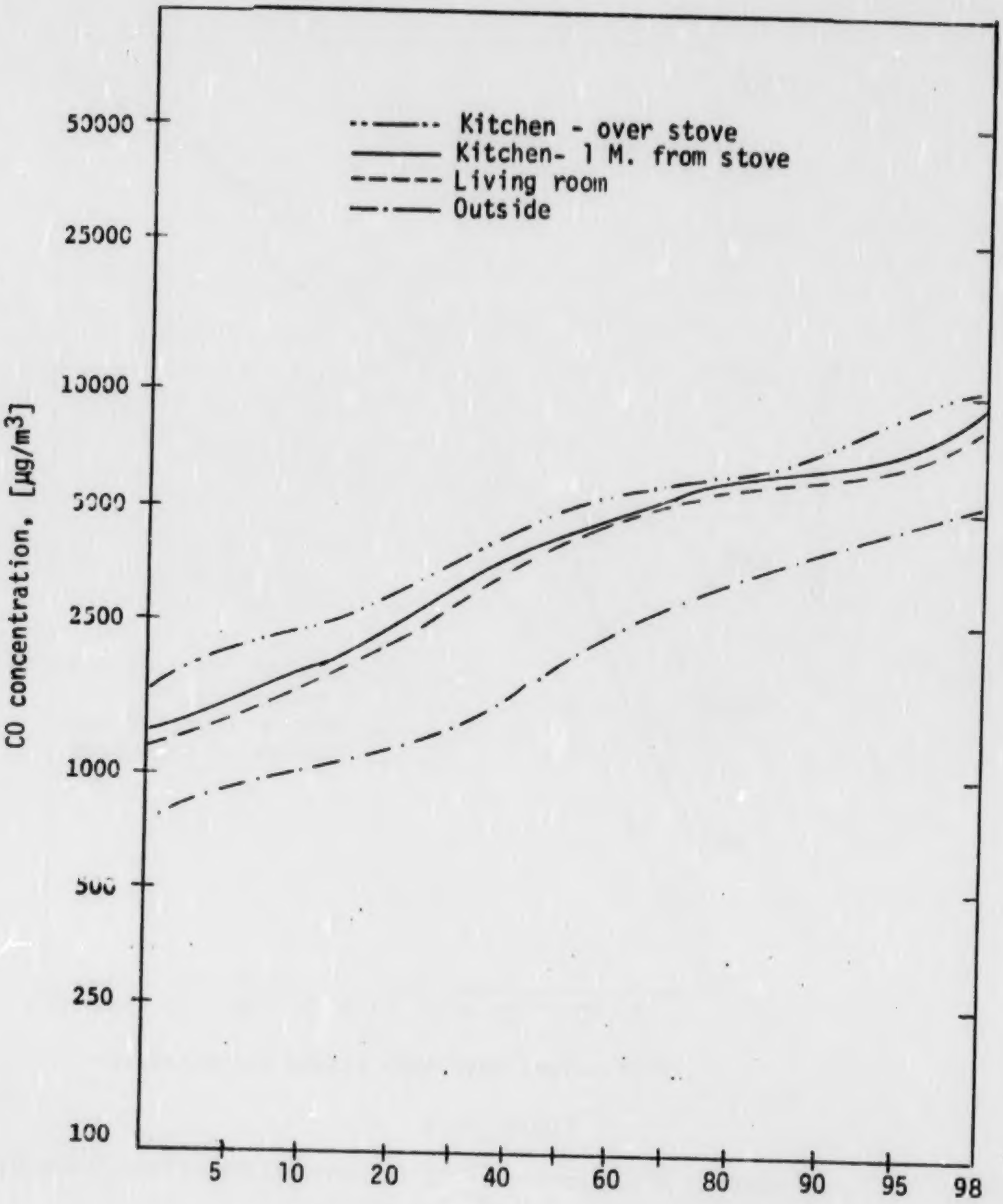

FIGURE 4-13
House No. 1 - Frequency Distribution of CO Concentrations, Five-minute Data
Fall, 1973, 1st half of period

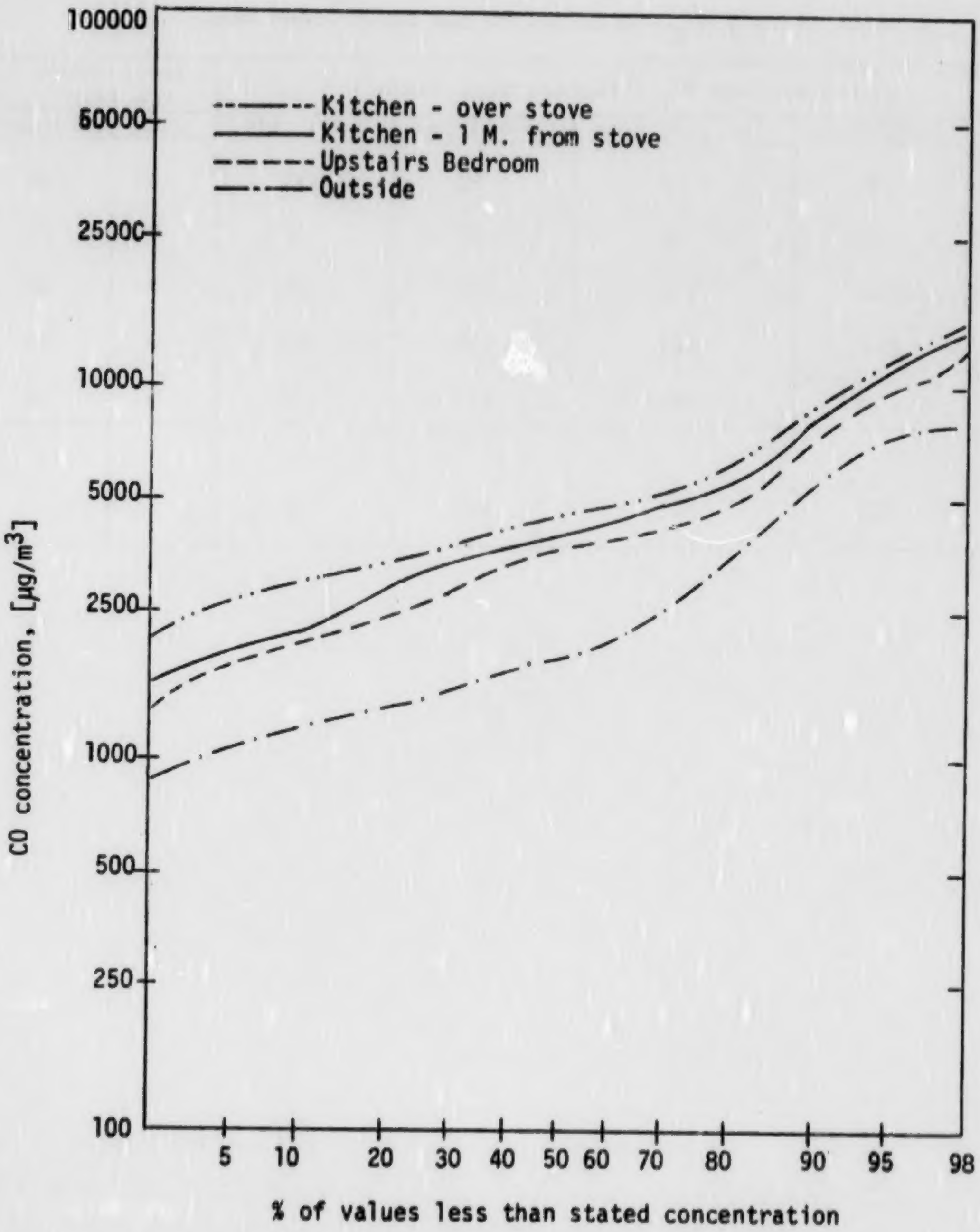

FIGURE 4-14

House No. 1 - Frequency Distribution of CO Concentrations, Five-minute Data
Fall, 1973, 2nd half of period

TABLE 4-10

Spring (1973) Sampling at House No. 2

DAILY AVERAGE NO_2 CONCENTRATION AND STOVE USAGE DATA

Date	Daily Average NO_2 Concentration, ($\mu g/m^3$)				Total Stove Use (Min)	
	1-Kitchen	2-Living Room	3-Bedroom	4-Outside	Oven	Burner
5/30/73	80	63	62	55	0	86
5/31/73	71	60	58	57	0	22
6/02/73	133	125	123	119	0	49
6/03/73	127	125	124	123	0	26
6/04/73	153	144	147	152	0	30
OVERALL DAILY AVERAGE	113	103	103	101		

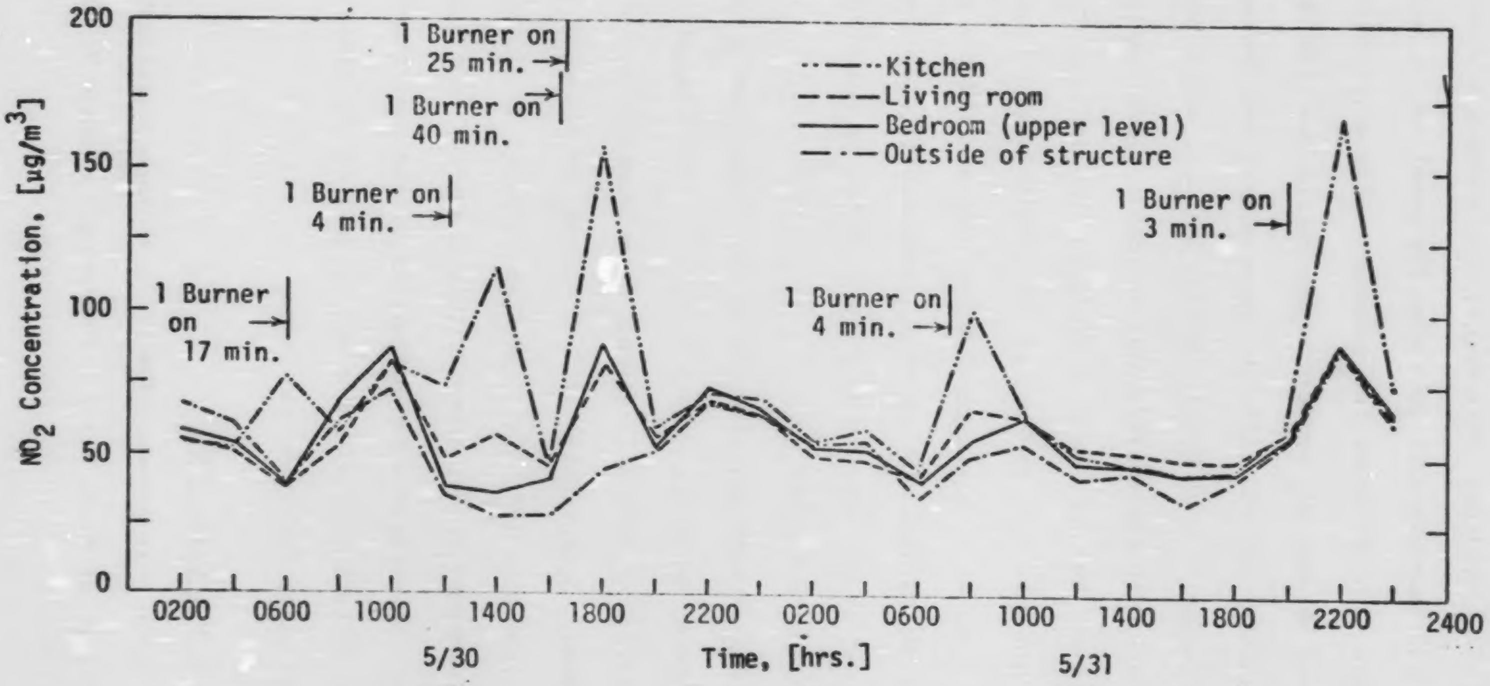

FIGURE 4-15

House No. 2 - A Time History of NO_2 Concentrations, 2-Hour Averages
Spring, 1973

operating periods on the kitchen locations and to a lesser extent on the other indoor locations. This figure also shows the uniformity of concentrations for all four sampling locations when the stove is not being used. By contrast, our results from the other two structures show a consistent difference between kitchen and outdoor NO_2 concentrations during inactive stove use periods. The explanation for the different observations was developed after evaluating stove operation in each house. Houses No. 1,3, and 4 have relatively new stoves, each with three continuous automatic pilot lights, one for each pair of burners and one for the oven/broiler. The much older stove in House No. 2, however, has only a single manual pilot which must be activated first before igniting a burner. This type of pilot uses very little gas and therefore generates only a small amount of NO_2 compared to the multiple continuous pilots of the newer stoves which generate enough NO_2 to maintain a kitchen concentration higher than outside levels.

A frequency distribution of the five-minute averaged NO_2 data for the spring data at House No. 2 is presented in Figure 4-16. The distribution of concentrations is identical for all four locations for about 90% of the observations. Approximately 50% of the NO_2 levels measured at all four locations were greater than 100 $\mu g/m^3$. Similar to House No. 1, the kitchen had a greater frequency of NO_2 concentration above 100 $\mu g/m^3$ than the other sampling locations. We attribute the uniformity of the distributions for all four locations to both lack of stove use as well as the absence of multiple, continuous pilot lights on the stove.

4.2.2 Nitric Oxide (NO)

Table 4-11 presents the daily average nitric oxide (NO) concentrations at House No. 2. The overall average NO concentration within

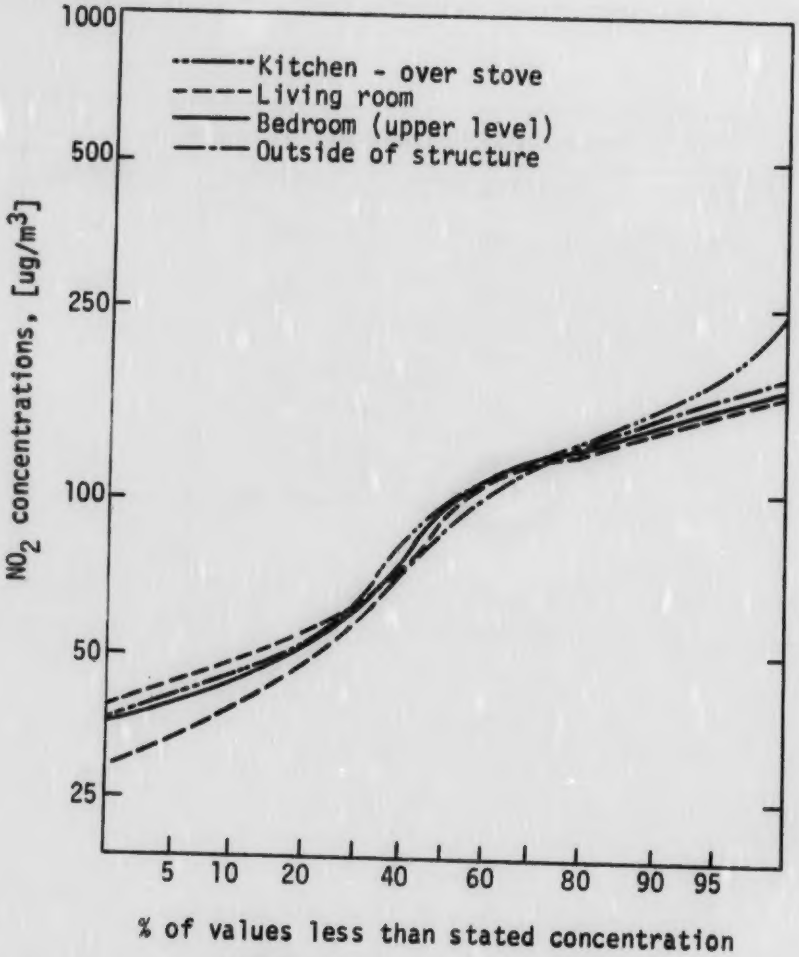

FIGURE 4-16

House No. 2 - Frequency Distribution of NO_2 Concentrations, Five-minute Data
Spring, 1973

TABLE 4-11

Spring (1973) Sampling at House No. 2

DAILY AVERAGE NO CONCENTRATION AND STOVE USAGE DATA

Date	Daily Average NO_2 Concentration, ($\mu g/m^3$)				Total Stove Use (Min)	
	1-Kitchen	2-Living Room	3-Bedroom	4-Outside	Oven	Burner
5/30/73	65	46	43	36	0	86
5/31/73	31	19	15	14	0	22
6/02/73	34	27	27	25	0	49
6/03/73	35	28	29	24	0	26
6/04/73	42	31	27	22	0	30
OVERALL DAILY AVERAGE	41	30	28	24		

the kitchen during the sampling period was greater than the overall outside NO concentration by 70%. The contribution of the stove to NO concentrations in the kitchen is more apparent than for NO_2. Outdoor NO concentrations were much lower than the corresponding NO_2 values during the sampling period and therefore ambient NO penetration did not influence the kitchen NO concentrations as greatly as ambient NO_2 influenced the kitchen NO_2 measurements.

A graph of the two-hour average NO concentration for a two-day period at House No. 2 is presented in Figure 4-17. A tabulation of the two-hour averages for the entire sampling period at House No. 2 is in Appendix B-3. The graph shows that the generation and diffusion of NO followed a pattern similar In comparing Figure 4-17 with Figure 4-15, the higher ambient NO_2 causes the indoor NO_2 levels to be much higher than NO indoor concentrations during periods of stove inactivity.

Figure 4-18 is a graph of the frequency distribution of the five-minute NO data from House No. 2. The distributions of the four sampling locations are not identical but certainly very similar. The kitchen has slightly greater frequency for higher NO concentrations than the other three sampling locations particularly above 200 $\mu g/m^3$.

4.2.3 Carbon Monoxide (CO)

A summary of the carbon monoxide daily averages at House No. 2 is given in Table 4-12. There is little difference in the concentrations measured at the three indoor and one outdoor locations. In fact, on the day of highest stove usage, (5/30), the daily average in the kitchen is somewhat lower than the outside concentration. Outdoor CO concentrations greatly influenced the indoor concentrations.

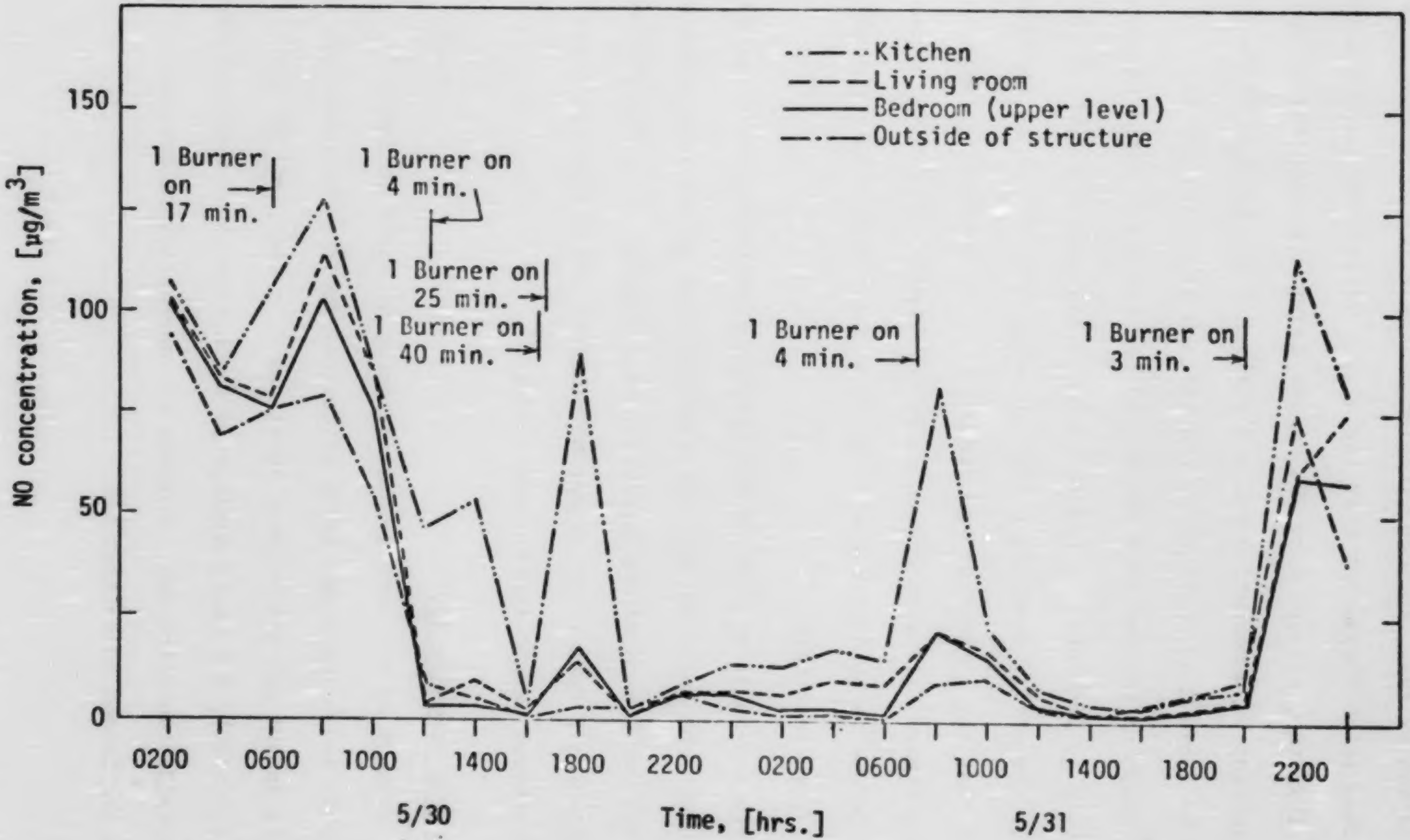

FIGURE 4-17

House No. 2 - A Time History of NO Concentrations, 2-Hour Averages

Spring, 1973

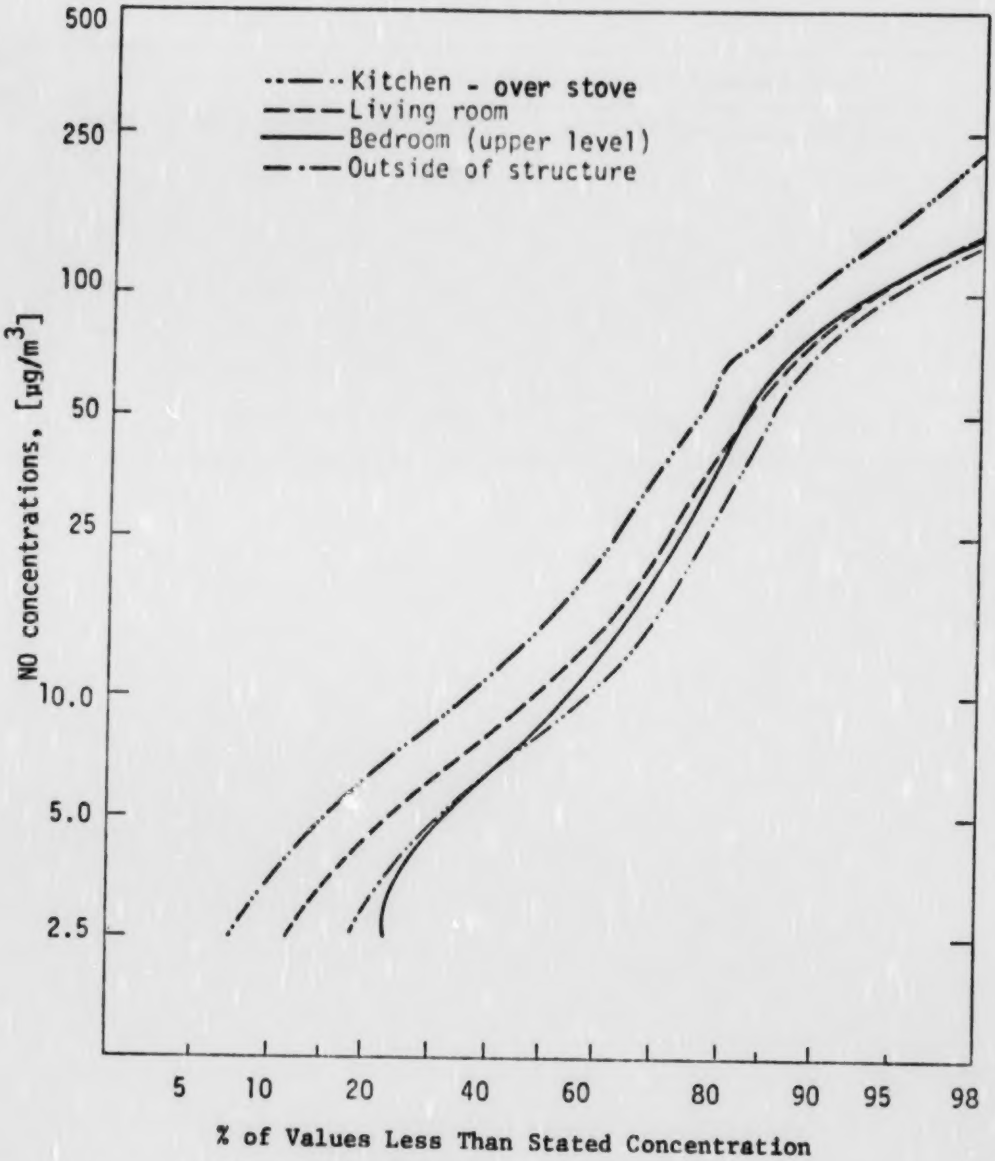

FIGURE 4-18

House No. 2 - Frequency Distribution of NO Concentrations, Five-minute Data
Spring, 1973

TABLE 4-12

Spring (1973) Sampling at House No. 2

DAILY AVERAGE CO CONCENTRATION AND STOVE USAGE DATA

Date	Daily Average NO_2 Concentration, ($\mu g/m^3$)				Total Stove Use (Min)	
	1-Kitchen	2-Living Room	3-Bedroom	4-Outside	Oven	Burner
5/30/73	2950	3440	2920	3170	0	86
5/31/73	2650	2510	2520	2550	0	22
6/06/73	3460	3300	3260	3100	0	10
OVERALL DAILY AVERAGE	3000	3080	2900	2940		

Figure 4-19 is a graph of the two-hour average CO concentrations for a two-day period at House No. 2. Appendix B-3 contains all of the two-hour averaged data for the sampling period. The time variation of CO is very similar to that of NO. The outdoor concentrations fluctuate considerably and the indoor concentrations at the three locations generally follow the outdoor pattern. The influence of the stove on indoor CO concentrations is shown briefly during operating periods and afterwards the indoor concentration rapidly declines to the outdoor CO concentration.

Figure 4-20 is a frequency distribution of all the five-minute CO data recorded at House No. 2. The four curves for the four sampling locations are closely spaced and frequently cross each other. The occurrence of any specific concentration was fairly uniform irregardless of sampling location. Overall stove inactivity was responsible for the close proximity of the indoor concentration to the outdoor CO levels.

4.2.4 NO_2, NO, CO Diffusion Experiment

Although the small amount of stove usage at House No. 2 produced a disappointingly small amount of interesting data, the relative inactivity gave us an excellent opportunity to conduct a diffusion experiment. The purpose of this experiment was to study the behavior of the 3 pollutants as they diffused through the house and became diluted with outdoor air.

We operated all five burners of the stove for a period of 71 minutes until pollutant concentrations in the kitchen approached a maximum. The burners were then shut off and the sampling for NO_2, NO and CO continued until the indoor concentrations returned to their former levels.

Table 4-13 shows the peak values measured at each indoor sampling location before the burners were shut off. The living room and bedroom

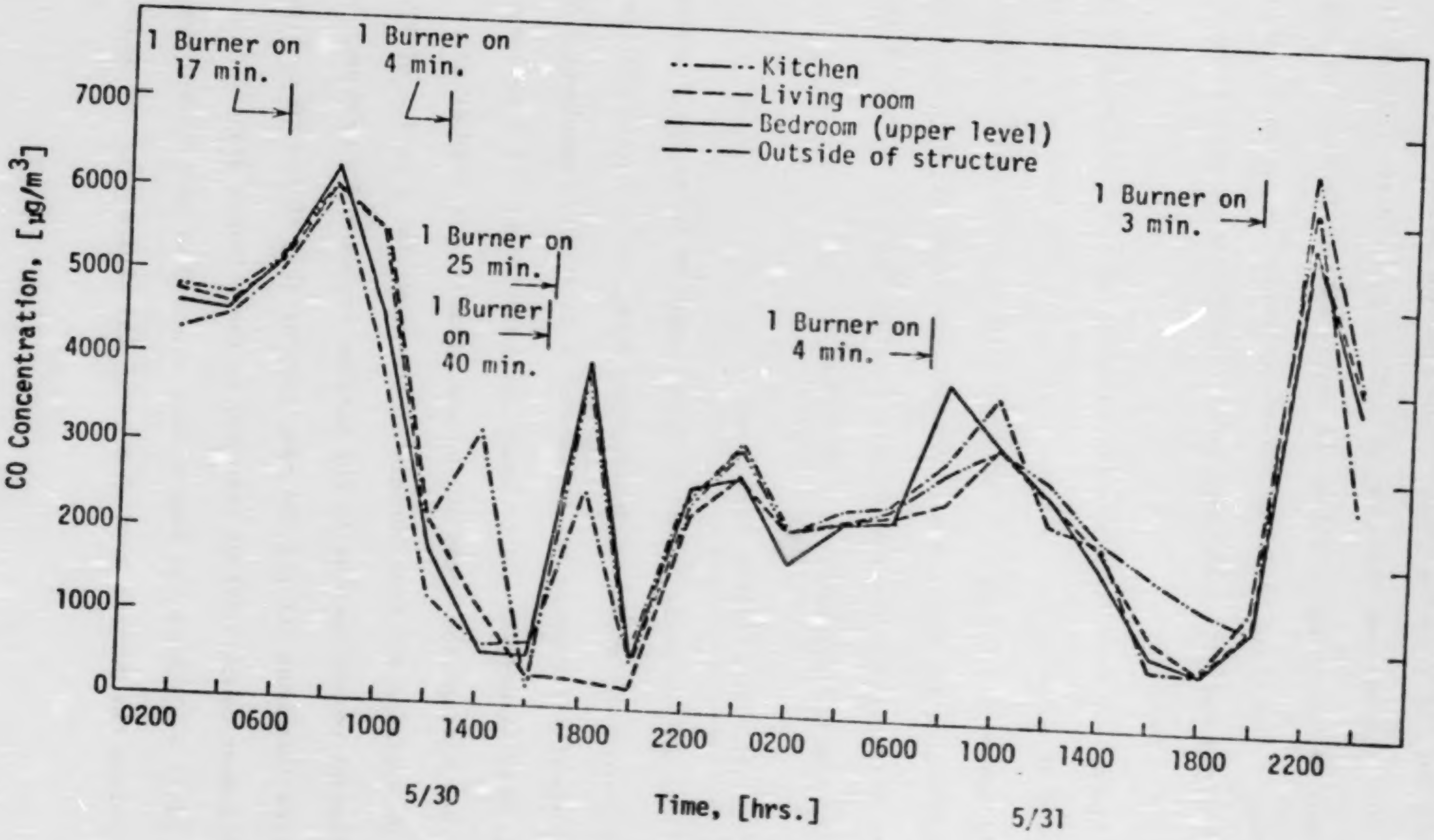

FIGURE 4-19

House No. 2 - A Time History of CO Concentrations, 2-Hour Averages
Spring, 1973

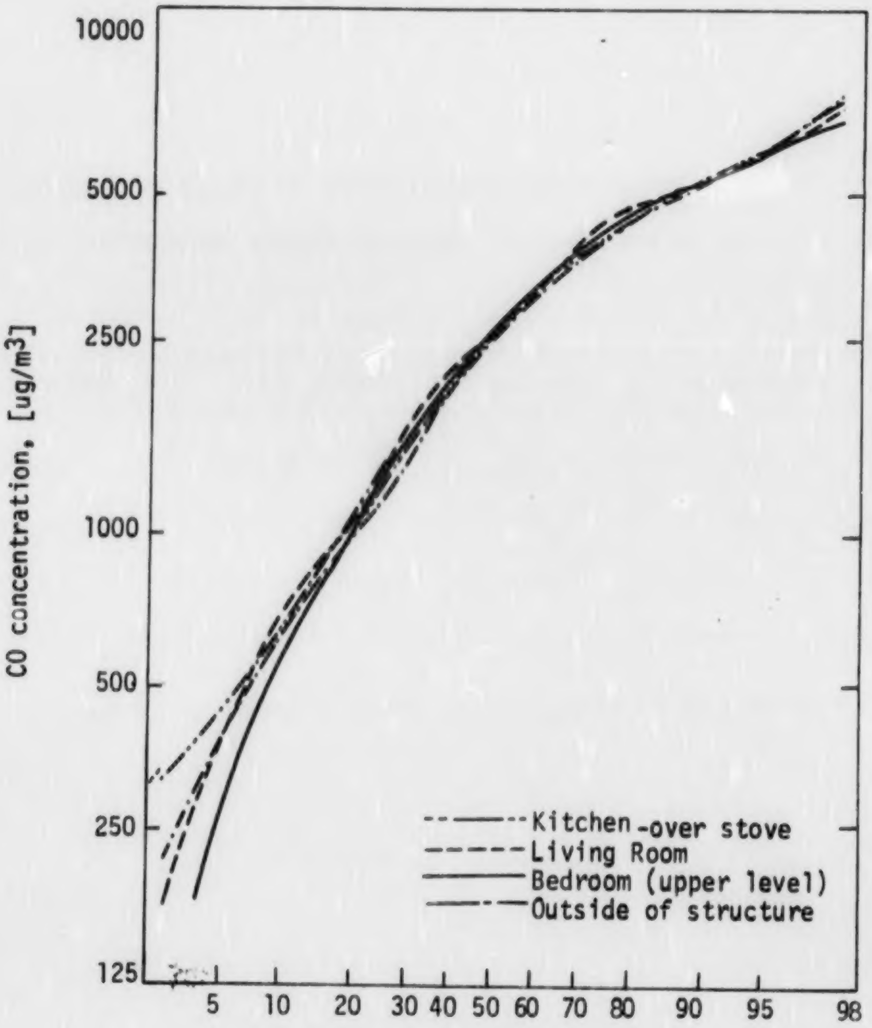

FIGURE 4-20

House No. 2 - Frequency Distribution of CO Concentrations, Five-minute Data
Spring, 1973

TABLE 4-13

PEAK FIVE-MINUTE CONCENTRATIONS OF OXIDES OF NITROGEN AND CARBON MONOXIDE DURING DIFFUSION EXPERIMENTS, $\mu g/m^3$

Parameter	Kitchen	Living Room	Bedroom
NO_2	1,450	900 (62%)*	790 (55%)*
NO	2,030	1,560 (77%)*	1,400 (69%)*
CO	12,800	10,400 (81%)*	9,300 (73%)*

*** Percent of five-minute peak value measured in kitchen.**

concentrations are also expressed as percentages of the peak kitchen concentration for each pollutant. The living room and bedroom peak values showed that both CO and NO were conserved to a considerably greater extent than NO_2 as they diffused through the house. NO_2 disappears either through reaction or surface adsorption as it diffuses through the house.

Figures 4-21, 4-22 and 4-23 show graphically the time history of the NO_2, NO and CO concentrations respectively during the diffusion experiment at House No. 2. All of the indoor sampling locations showed sharply increased pollutant concentrations within the first five-minute sampling period at each location and all locations had a similar decay rate for the same pollutant when the burners were shut off.

The NO_2 exhibited the most rapid decay; it reached pre-experiment levels about 2 1/2 hours from the time the stove was turned off. The CO required about 7 hours to return to previous levels and the NO about 8 hours. From the shapes of the three curves, we computed that the half life of CO in the house was 2.1 hours. Since CO is unreactive, this half life represents loss solely through diffusion and dilution. The half lives for NO and NO_2 were 1.8 and 0.6 hours respectively. The behavior of NO is quite similar to that of CO. Thus, the oxidation of NO to NO_2 or loss through other mechanisms is not significant. NO_2, on the other hand, is lost relatively rapidly. Among the possible mechanisms for the depletion of NO_2 is the formation of nitrate and/or nitrite aerosol. Such a mechanism might be enhanced by the high moisture content of kitchens with gas stoves -- water vapor production associated with cooking, and that produced as a by product in the combustion of natural gas. Some of our data from the other structures show more NO_2 than NO present during inactive stove use periods which perhaps can only be explained by the generation of more NO_2 than NO from the pilot lights since NO_2 should disappear more rapidly than NO when neither are being generated.

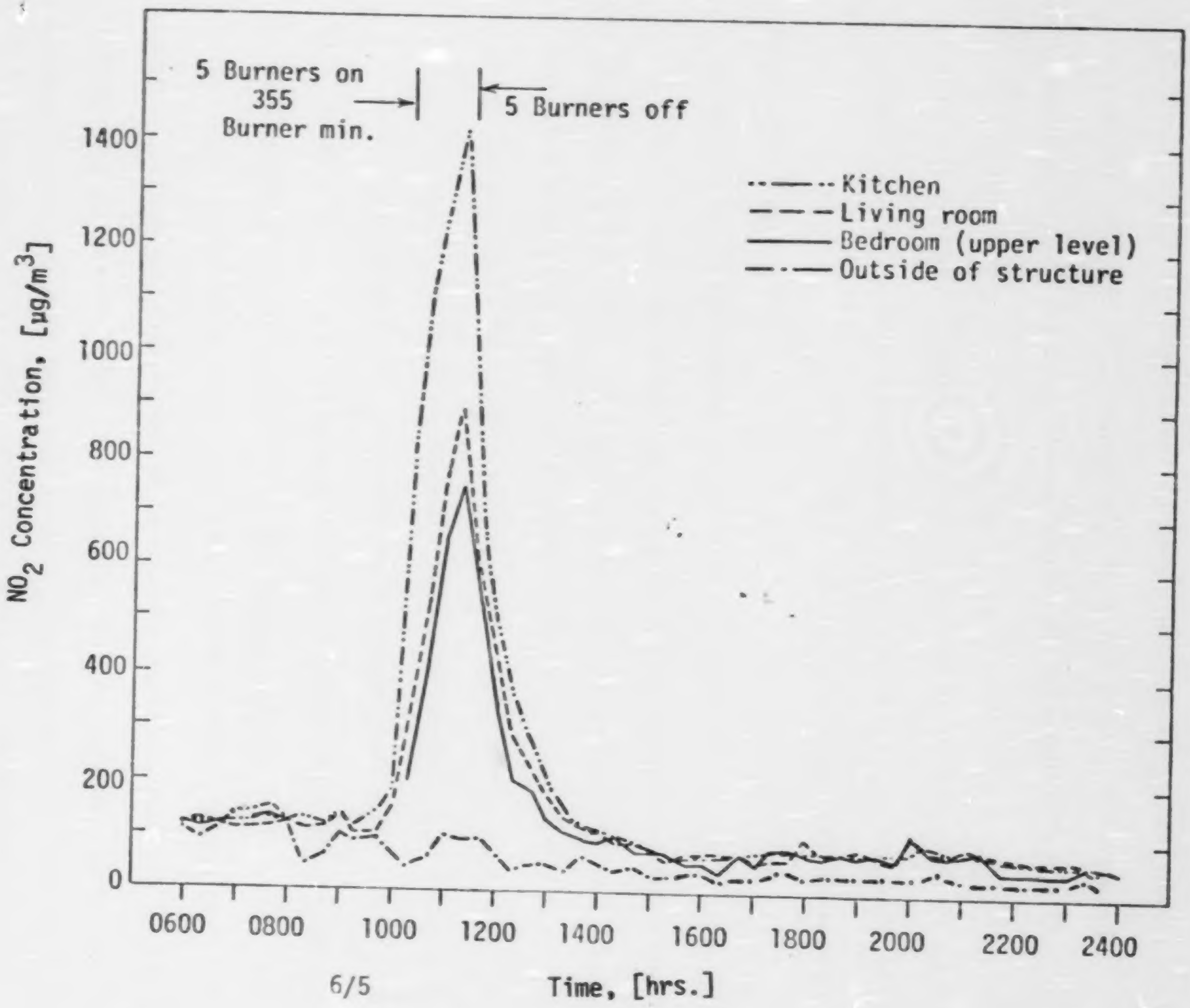

FIGURE 4-21

House No. 2 - Decay of NO_2 Concentrations, Five-minute Data vs. Time

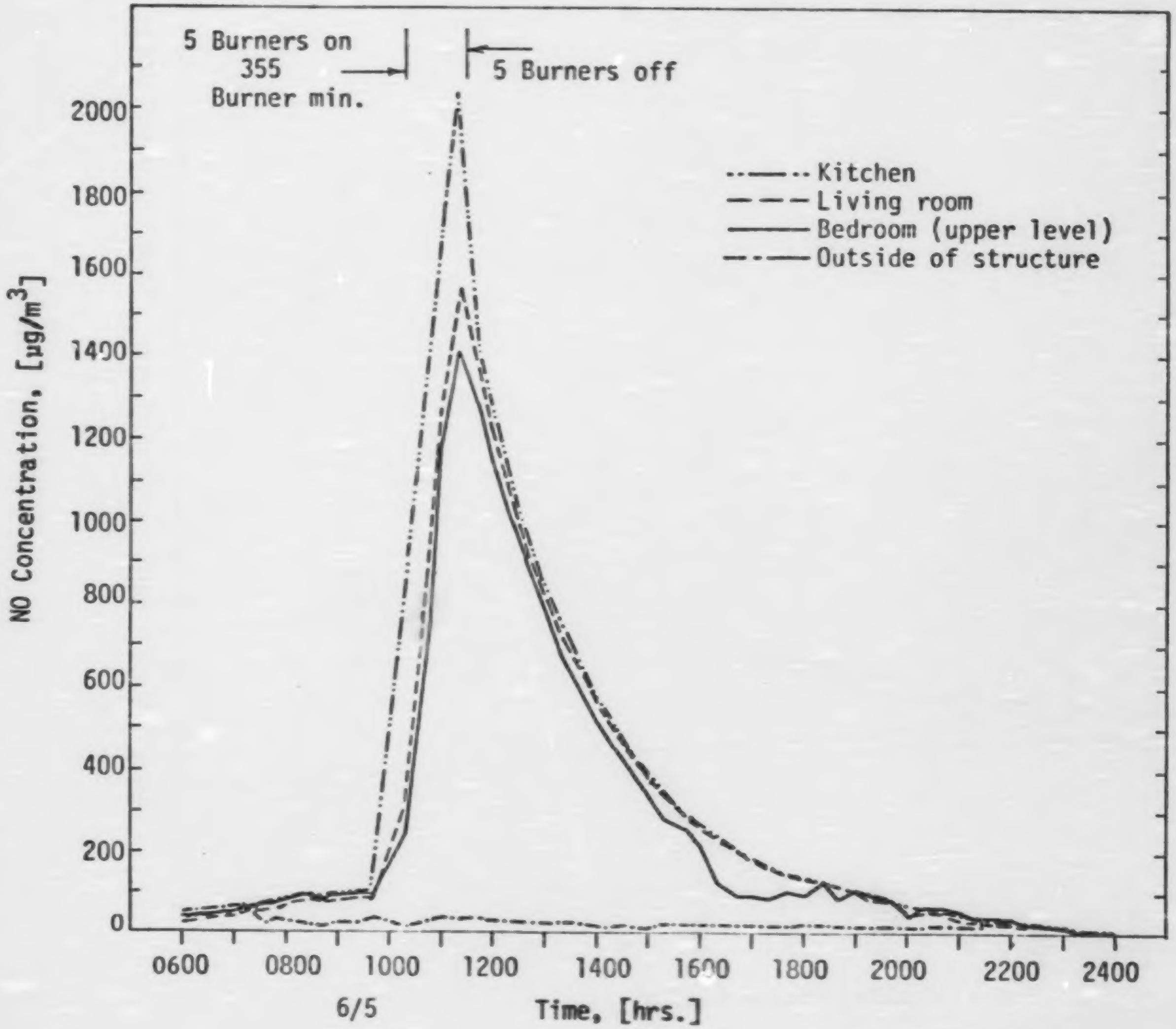

FIGURE 4-22

House No. 2 - Decay of NO Concentrations, Five-minute Data vs. Time

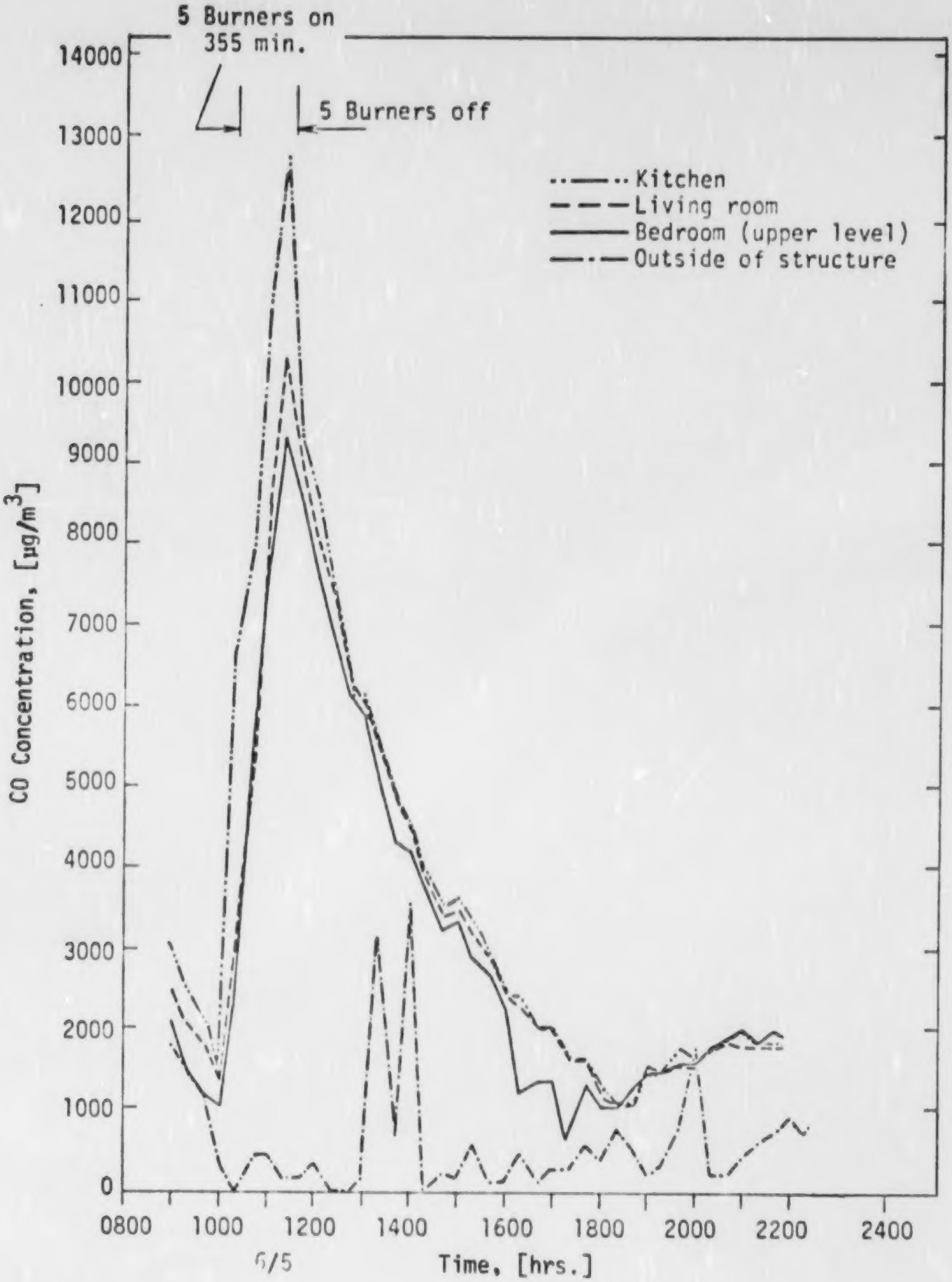

FIGURE 4-23
House No. 2 - Decay of CO Concentrations, Five-minute Data vs. Time

4.3 House No. 3 Suburban Two-Story Apartment

4.3.1 Nitrogen Dioxide (NO_2)

Tables 4-14 and 4-15 show respectively the summer and fall daily average data for NO_2 at House No. 3. In addition we present Table 4-16 which summarizes the data for both seasons to facilitate their comparison. Because of severe instrument malfunction problems in this house we had available only two complete days of sampling during the spring-summer period and one and three days respectively during each of the two fall periods. Nevertheless, we believe it is still possible to draw conclusions from the available data on the effect of stove use and outdoor air quality on the concentrations of pollutants found inside this house.

Concentrations of NO_2 in the kitchen of this home exceeded 100 $\mu g/m^3$ even when the stove is little used. Note that on 6/22 the daily average kitchen concentrations exceed 100 $\mu g/m^3$ with only 5 minutes of stove use. However, at this time outdoor concentrations were relatively high (60 $\mu g/m^3$). In this connection, we point out that outdoor concentrations were higher in the spring-summer period than the fall-winter period. These conditions are the reverse of those encountered while sampling at House No. 1.

One reason for the elevated NO_2 readings in the kitchen of this house in spite of a low level of stove use is undoubtedly the stove pilot lights. Another reason for this effect is the configuration of the kitchen. This kitchen is a small, unventilated workspace that is relatively isolated from the rest of the living quarters. This configuration appears to inhibit the diffusion of NO_2 into the other rooms. The sharp drop in measured NO_2 concentration from the kitchen to the other indoor sampling locations is further evidence of the slow diffusion of kitchen air to the rest of the apartment.

TABLE 4-14

Spring - Summer (1973) Sampling at House No. 3

DAILY AVERAGE NO_2 CONCENTRATION AND STOVE USAGE DATA

Date	Daily Average NO_2 Concentration, ($\mu g/m^3$)				Total Stove Use (min)	
	1-Kitchen (above stove)	2-Living Room	3-Upper Bedroom	4-Outside	Oven	Burner
6/21/73	116	75	53	42	0	17
6/22/73	111	75	62	60	0	5
OVERALL DAILY AVERAGE	114	75	58	51		

TABLE 4-15

Fall-Winter (1973) Sampling at House No. 3

DAILY AVERAGE NO_2 CONCENTRATION AND STOVE USAGE DATA

Date	Daily Average NO_2 Concentration, ($\mu g/m^3$)					Total Stove use (min)	
	1-Kitchen (above stove)	1A-Kitchen (1 meter from stove)	2-Living Room	3-Bedroom	4-Outside	Oven	Burner
11/30/73	53	47	28		35	0	20
OVERALL DAILY AVERAGE	53	47	28		35		
12/15/73	161	87		63	30	0	37
12/16/73	160	93		58	30	0	63
12/23/73	220	241		89	37	75	48
OVERALL DAILY AVERAGE	180	140		70	32		

Indoor sampling locations, outside of the kitchen, had overall average NO_2 levels during both sampling periods that were noticeably lower than the other three structures despite the high concentration in the kitchen.

In Table 4-16 we see that the overall average NO_2 concentration in the living room during the summer was 66% of the corresponding NO_2 concentration directly over the stove. In the first part of the fall sampling period, at the same location, the NO_2 level was only 53% of that measured directly over the stove. This could be the result of the occupant sealing off direct access to the living room from the kitchen with a plywood section between the spring and fall sampling periods. However, such a conclusion is somewhat conjectural in view of the limited number of complete sampling days available.

A comparison of indoor/outdoor ratios in the spring and fall (2nd half) shows the joint effect of stove use and permeability of the apartment. Note that in the spring the indoor/outdoor ratio for the kitchen is about 2 but drops to almost 1 in the bedroom. In the second half of the fall the ratio exceeds 5 in the kitchen corresponding to a 7 times higher stove use than in the spring, but the indoor/outdoor ratio in the bedroom remains above 2 in the fall presumably because of the decreased permeability.

Figure 4-24 is a graph of some of the typical two hour average NO_2 data from the spring sampling period at House No. 3. The graph shows how short burner operating times result in considerable increases in NO_2 concentrations in the kitchen which decay very slowly and consistantly remain higher than outside and other indoor NO_2 concentrations. We suspect that the limited kitchen ventilation and the pilot lights are responsible for the increased concentrations of NO_2 in the kitchen of this house.

TABLE 4-16

SUMMARY OF AVERAGE NO_2 VALUES AND STOVE USE

House No. 3 - Spring and Fall Sampling, 1973

Season and Data Category	Sampling Location					Average Stove Use (min/day)		
	Kitchen (above stove)	Kitchen (1 meter from stove)	Living Room	Bedroom	Outside	Oven	Burner	Total
Spring-Summer, 1973								
NO_2 Concentration, $\mu g/m^3$	114	--	75	58	51	0	11	11
% of max. kitchen value	100	--	66	51				
Indoor/Outdoor ratio	2.23	--	1.47	1.14	1.00			
Fall, 1973 (first half)*								
NO_2 Concentration, $\mu g/m^3$	53	47	28	--	35	0	20	20
% of max. kitchen value	100	88	53	--	--			
% of remote kitchen value		100	60					
Indoor/Outdoor ratio	1.51	1.34	0.80	--	1.00			
Fall-Winter, 1973 (second half)								
NO_2 Concentration, $\mu g/m^3$	180	140	--	70	32	25	49	74
% of max. kitchen value	100	78	--	39	--			
% of remote kitchen value	--	100	--	50	--			
Indoor/Outdoor ratio	5.62	4.38	--	2.19	1.00			

*Based on data for only one day.

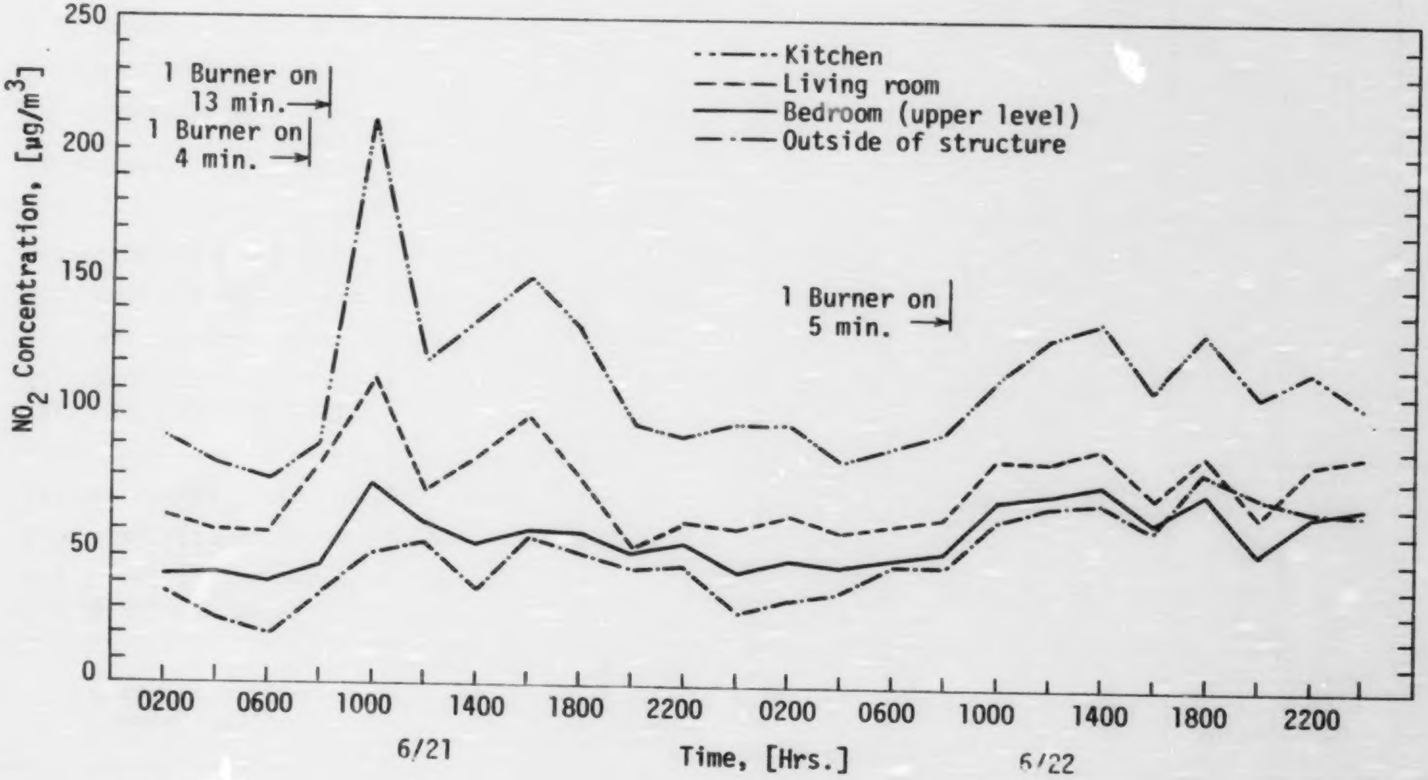

FIGURE 4-24

House No. 3 - A Time History of NO_2 Concentrations, 2-hour Averages

Spring, 1973

Figure 4-25 presents a more detailed look at a portion of the data contained in Figure 4-24 by utilizing the five-minute data obtained directly from the strip charts. The immediate response to stove operation is quite evident by observing the kitchen trace at approximately 0815. Notice that approximately one hour earlier the living room NO_2 concentration shows a sharp peak. Examination of the stove use log kept by the occupants and the original strip chart showed that one burner was turned on for 4 minutes at the same time the living room sampling location was in its 5 minute active mode. No effect of this brief stove use is recorded by the kitchen since the kitchen location was not actively sampling until 15 minutes later. During periods when the stove is inactive the indoor and outdoor concentrations generally rise and fall together which shows the influence of outdoor NO_2 penetrating the structure. At all times, however, a sharp differential existed between the kitchen and outdoor concentrations.

In view of the considerable loss of NO_2 data at this house at non-random times, we do not present frequency distributions for NO_2 at House No. 3.

4.3.2 Nitric oxide (NO)

Tables 4-17 and 4-18 present the daily average data for NO at House No. 3 during the spring-summer and fall-winter periods respectively. Table 4-19 summarizes the average data from both periods to facilitate comparisons. As in the case of NO_2, there are relatively few complete days during each sampling period on which to base our evaluations.

While outdoor NO_2 levels were 1/3 greater in the summer than in the winter, outdoor NO was about the same during the spring and second half of the fall period and about twice as high in the first part of the fall period as compared to either of the other two periods. These relatively higher outdoor concentrations account for some of the higher indoor levels of NO found in the winter

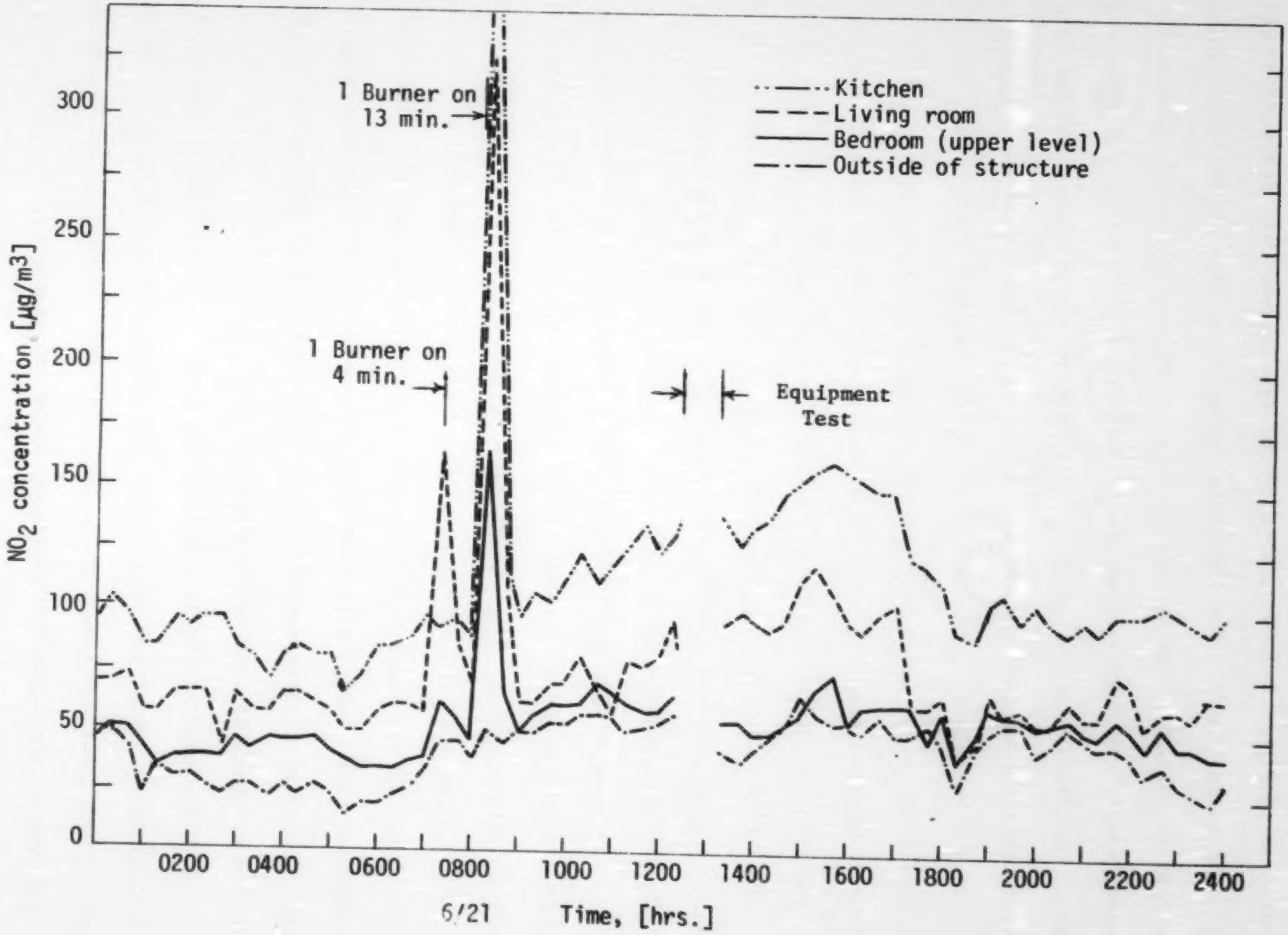

FIGURE 4-25

House No. 3 - A Time History of NO_2 Concentrations, Five-minute Data
Spring, 1973

TABLE 4-17

Spring - Summer (1973) Sampling at House No. 3

DAILY AVERAGE NO CONCENTRATION AND STOVE USAGE DATA

Date	Daily Average NO Concentration, ($\mu g/m^3$)				Total Stove Use (min)	
	1-Kitchen (above stove)	2-Living Room	3-Upper Bedroom	4-Outside	Oven	Burner
6/21/73	45	33	23	13	0	17
6/22/73	60	50	45	29	0	5
OVERALL DAILY AVERAGE	53	42	34	21		

TABLE 4-18

Fall-Winter (1973) Sampling at House No. 3

DAILY AVERAGE NO CONCENTRATION AND STOVE USAGE DATA

Date	Daily Average NO Concentration, ($\mu g/m^3$)					Total Stove use (min)	
	1-Kitchen (above stove)	1A-Kitchen (1 meter from stove)	2-Living Room	3-Bedroom	4-Outside	Oven	Burner
11/30/73	111	95	42		40*	0	20
OVERALL DAILY AVERAGE	111	95	42		40		
12/15/73	92	67		57	19	0	37
12/16/73	97	77		58	21	0	63
12/23/73	144	158		78	20	75	48
OVERALL DAILY AVERAGE	111	101		64	20		

*Based on 11 out of 12 valid 2-hour values.

TABLE 4-19

SUMMARY OF AVERAGE NO VALUES AND STOVE USE

House No. 3 - Spring and Fall Sampling, 1973

Season and Data Category	Sampling Location					Average Stove Use (min/day)		
	Kitchen (above stove)	Kitchen (1 meter from stove)	Living Room	Bedroom	Outside	Oven	Burner	Total
Spring-Summer, 1973								
NO Concentration, $\mu g/m^3$	53	--	42	34	21			
% of remote kitchen value	100	--	79	64	--	0	11	11
Indoor/Outdoor ratio	2.52	--	2.00	1.62	1.00			
Fall, 1973 (first half)*								
NO Concentration, $\mu g/m^3$	111	95	42		40			
% of max. kitchen value	100	86	38		--	0	20	20
% of remote kitchen value		100	44					
Indoor/Outdoor ratio	2.78	2.38	1.05		1.00			
Fall-Winter, 1973 (second half)								
NO Concentration, $\mu g/m^3$	111	101		64	20	25	49	74
% of max. kitchen value	100	91		58	--			
% of remote kitchen value		100		63				
Indoor/Outdoor ratio	5.55	5.05		3.20	1.00			

* Based on data for only one day.

but in addition the apartment being less permeable in the winter also allows build up of NO indoors. To illustrate this point, note the pattern of indoor/outdoor ratios for the spring and second half of the fall in Table 4-19. As in the case of NO_2 (see Table 4-16) this comparison shows the joint influence of stove use and house permeability. In addition in comparing these two tables we can see clearly the difference in behavior of NO and NO_2. Recall that in the spring the indoor/outdoor ratio for NO_2 dropped to almost 1 in the bedroom. While there is a significant drop in this ratio between the kitchen and bedroom for NO during this period, the bedroom ratio is 40 percent higher for NO than NO_2. This difference is shown even more clearly in comparing indoor/outdoor ratios for NO and NO_2 in the second half of the fall period. The ratio for NO drops from 5.5 to 3.2 between the kitchen and the bedroom while that for NO_2 drops from 5.6 to 2.2. These observations substantiate the results of the diffusion experiment carried out in House No. 2 where we noted the reduced half life of NO_2 as compared with that of NO.

A graph of the two-hour average data from the spring shown in Figure 4-26 is essentially similar in shape to Figure 4-24 for NO_2. The only significant difference is that there is not as sharp a drop in concentrations between the kitchen and the other rooms of the house. This phenomenon, we believe, illustrates the difference in decay characteristics of NO and NO_2 as discussed elsewhere in the report.

As in the case of NO_2 we do not present frequency distributions for NO because of the limited data here.

4.3.3 Carbon Monoxide (CO)

Tables 4-20 and 4-21 present the daily average CO concentrations at House No. 3 during the summer and fall-winter sampling periods respectively.

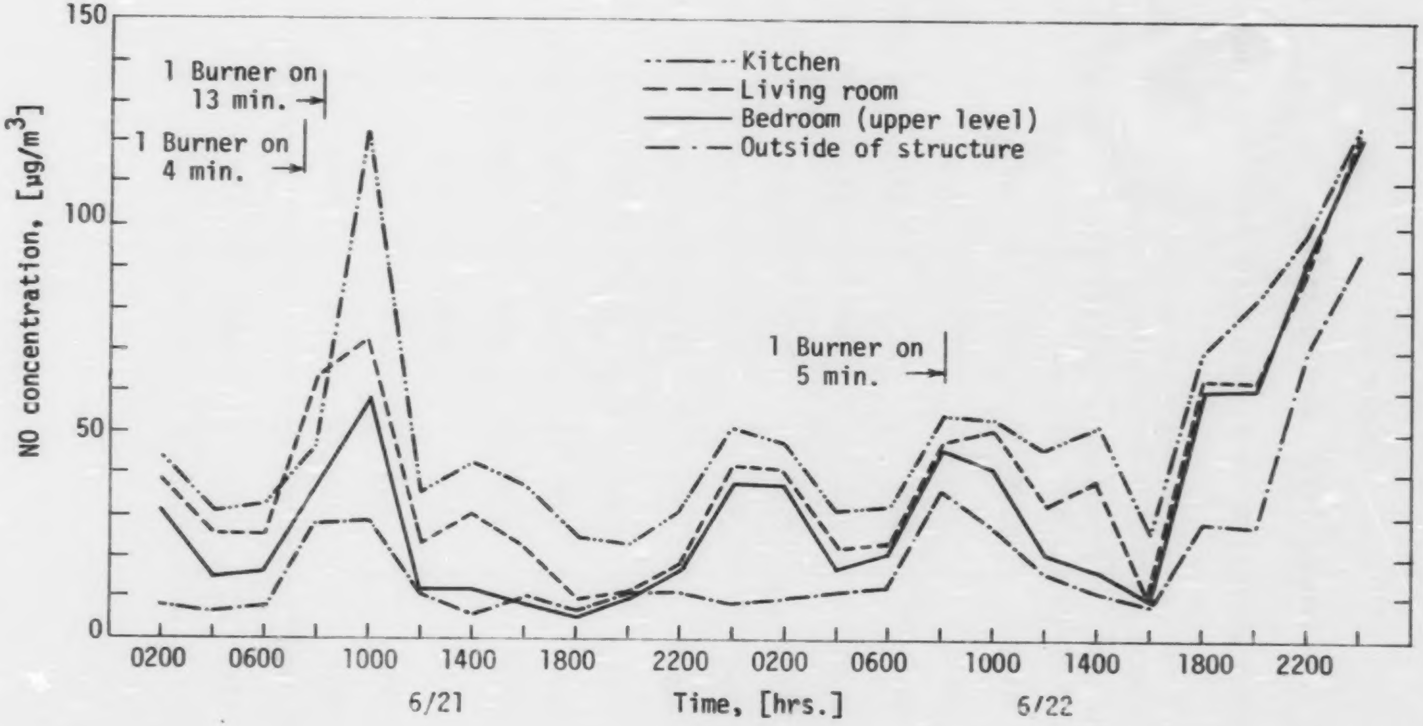

FIGURE 4-26

House No. 3 - A Time History of NO Concentrations, 2-hour Averages
Spring, 1973

TABLE 4-20

Summer (1973) Sampling at House No. 3

DAILY AVERAGE CO CONCENTRATION AND STOVE USAGE DATA

Date	Daily Average CO Concentration, ($\mu g/m^3$)				Total Stove Use (min)	
	1-Kitchen (above stove)	2-Living Room	3-Bedroom	4-Outside	Oven	Burner
6/22/73	3440	2720	2460	1810	0	5
6/23/73	3910	3210	3210	2950	34	28
6/24/73	3910	2720	2370	1790	0	77
6/25/73	4320	3010	3050	2600	0	55
6/26/73	3260	2190	2080	1820	65	25
6/27/73	3780	2040	2090	1650	0	21
7/06/73	4090	2820	2870	2470	0	0
7/07/73	5900	5010	4240	3920	0	14
7/08/73	4570	3590	2410	2000	0	24
7/09/73	4340	3270	1860	1470	30	0
7/10/73	5370	4490	2370	1780	0	14
7/11/73	5150	3920	2920	2220	0	0
7/12/73	4010	2730	2870	2540	52	38
OVERALL DAILY AVERAGE	4310	3210	2680	2230		

TABLE 4-21

Fall-Winter (1973) Sampling at House No. 3

DAILY AVERAGE CO CONCENTRATION AND STOVE USAGE DATA

Date	Daily Average CO Concentration, ($\mu g/m^3$)					Total Stove use (min)	
	1-Kitchen (above stove)	1A-Kitchen (1 meter from stove)	2-Living Room	3-Bedroom	4-Outside	Oven	Burner
11/29/73	6870	5360	3970		1860	0	73
12/07/73	7150	5830	4750		4100	0	25
12/08/73	7130	6010	4570		2660	51	50
12/09/73	8340	6990	5340		3290	15	91
12/10/73	9190	7530	6160		4920	0	84
12/11/73	8220	6800	5650		3440	0	5
OVERALL DAILY AVERAGE	7820	6420	5070		3380		
12/14/73	8860	7310		6820	2530	343	29
12/15/73	6150	4590		4230	1810	0	37
12/16/73	6450	5370		4770	2330	0	63
12/21/73	7680	7390		6560	3160	0	36
12/22/73	6520	6500		4850	2110	70	103
12/23/73	6740	6850		5530	2880	75	48
12/24/73	6980	7230		5400	2390	72	14
12/25/73	7650	7730		5810	2740	0	28
OVERALL DAILY AVERAGE	7130	6620		5500	2500		

Table 4-22 summarizes the data from all sampling periods.

Indoor CO concentrations are more strongly influenced by outdoor concentrations than by stove use. This experience is similar to that from the other houses. In contrast to House No. 1, the fall-winter CO levels outside were somewhat higher than those measured in the spring. We attribute this to differences in the meteorological conditions in the two separate sampling periods.

The indoor kitchen concentrations for the fall sampling period approached the air quality standard of 10,000 $\mu g/m^3$ for an 8-hour averaging period. This was due primarily to the high level of carbon monoxide measured outdoors. A secondary reason is the isolation of the kitchen from the rest of the living space. This results in less diffusion and dilution of the stove effluent. Overall, the contribution of carbon monoxide by the stove is of the same order as originally measured by TRC in 1969 and 1970 in our earlier study.*

Frequency distributions of the CO data at House No. 3 for the summer and first and the second week of the fall sampling periods, are presented in Figures 4-27, 4-28, and 4-29 respectively. We did not experience the same loss of CO data that we had for NO_2 and NO at this house. Tabulations of all two-hour average CO data for House No. 3 for the summer and fall sampling periods are presented in Appendices B-4 and B-5 respectively.

All three of these distributions are basically similar in shape except that the fall frequency distributions, Figures 4-28 and 4-29, show significantly higher concentrations, furthermore, there is greater separation of the

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*See Reference 1, Page 1

TABLE 4-22

SUMMARY OF AVERAGE CO VALUES AND STOVE USE

House No. 3 - Spring and Fall Sampling, 1973

Season and Data Category	Sampling Location					Average Stove Use (min/day)		
	Kitchen (above stove)	Kitchen (1 meter from stove)	Living Room	Bedroom	Outside	Oven	Burner	Total
Spring-Summer, 1973						14	23	37
CO Concentration, $\mu g/m^3$	4310	--	3210	2680	2230			
% of max. kitchen value	100	--	74	62	--			
Indoor/Outdoor ratio	1.93	--	1.44	1.20	1.00			
Fall, 1973 (first half)						11	55	66
CO Concentration, $\mu g/m^3$	7820	6420	5070	--	3380			
% of max. kitchen value	100	82	65	--	--			
% of remote kitchen value		100	79	--	--			
Indoor/Outdoor ratio	2.31	1.90	1.50	--	1.00			
Fall-Winter, 1973 (second half)						70	45	115
CO Concentration, $\mu g/m^3$	7130	6620	--	5500	2500			
% of max. kitchen value	100	93	--	77	--			
% of remote kitchen value		100	--	83	--			
Indoor/Outdoor ratio	2.85	2.65	--	2.20	1.00			

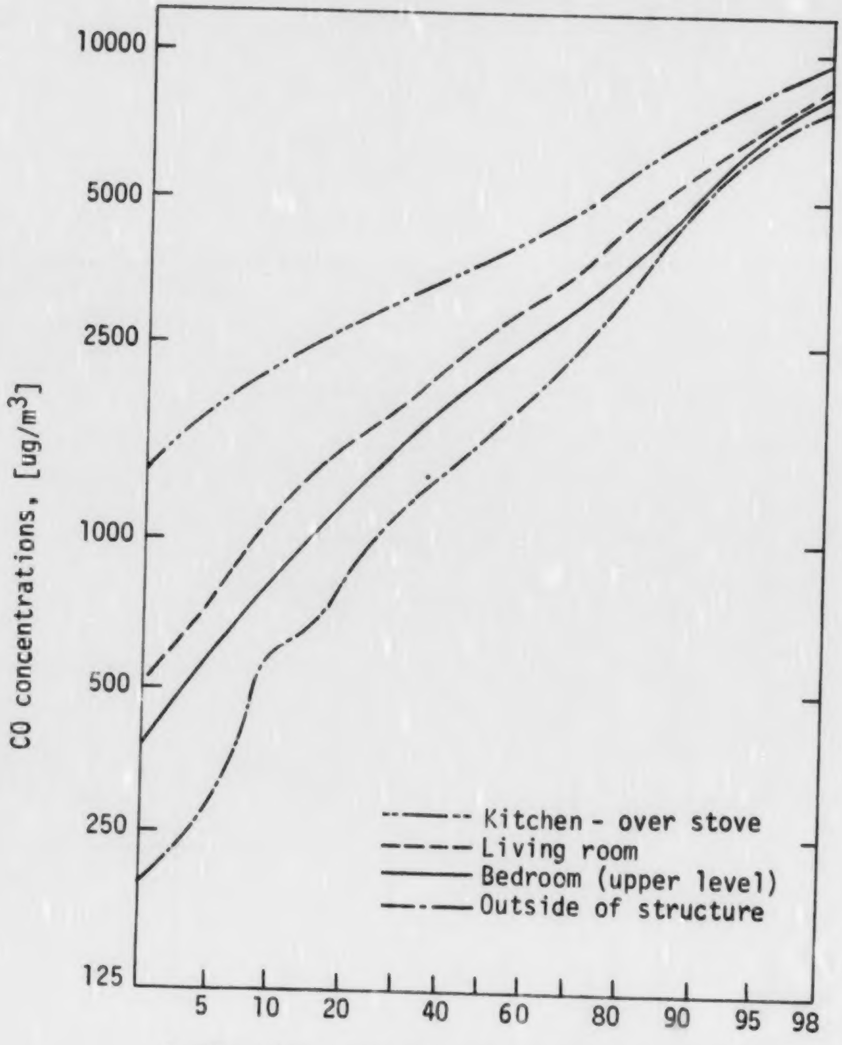

FIGURE 4-27

House No. 3 - Frequency Distribution of CO Concentrations, Five-minute Data
Spring, 1973

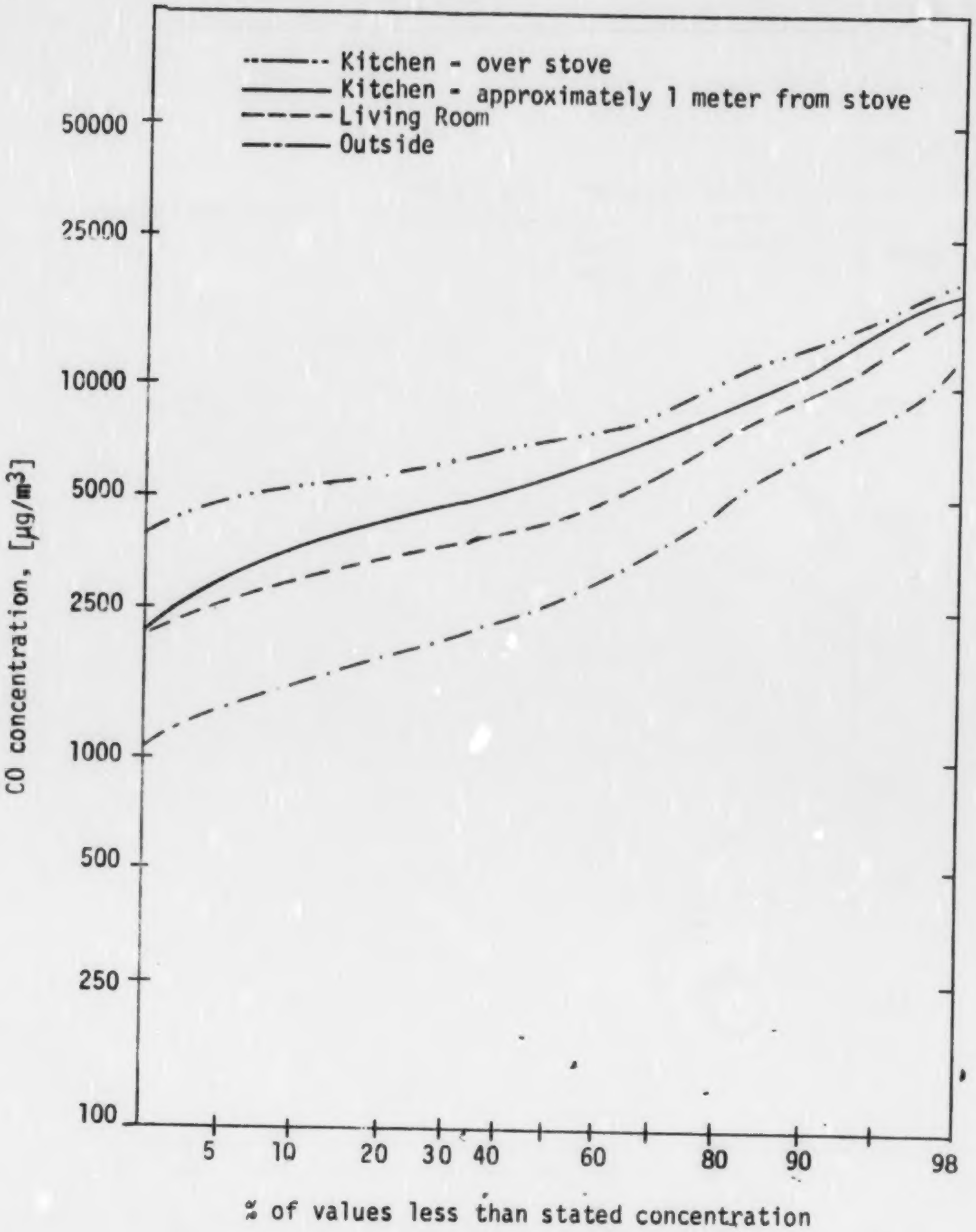

FIGURE 4-28

House No. 3 - Frequency Distribution of CO Concentrations, Five-minute Data
Fall, 1973, 1st half of period

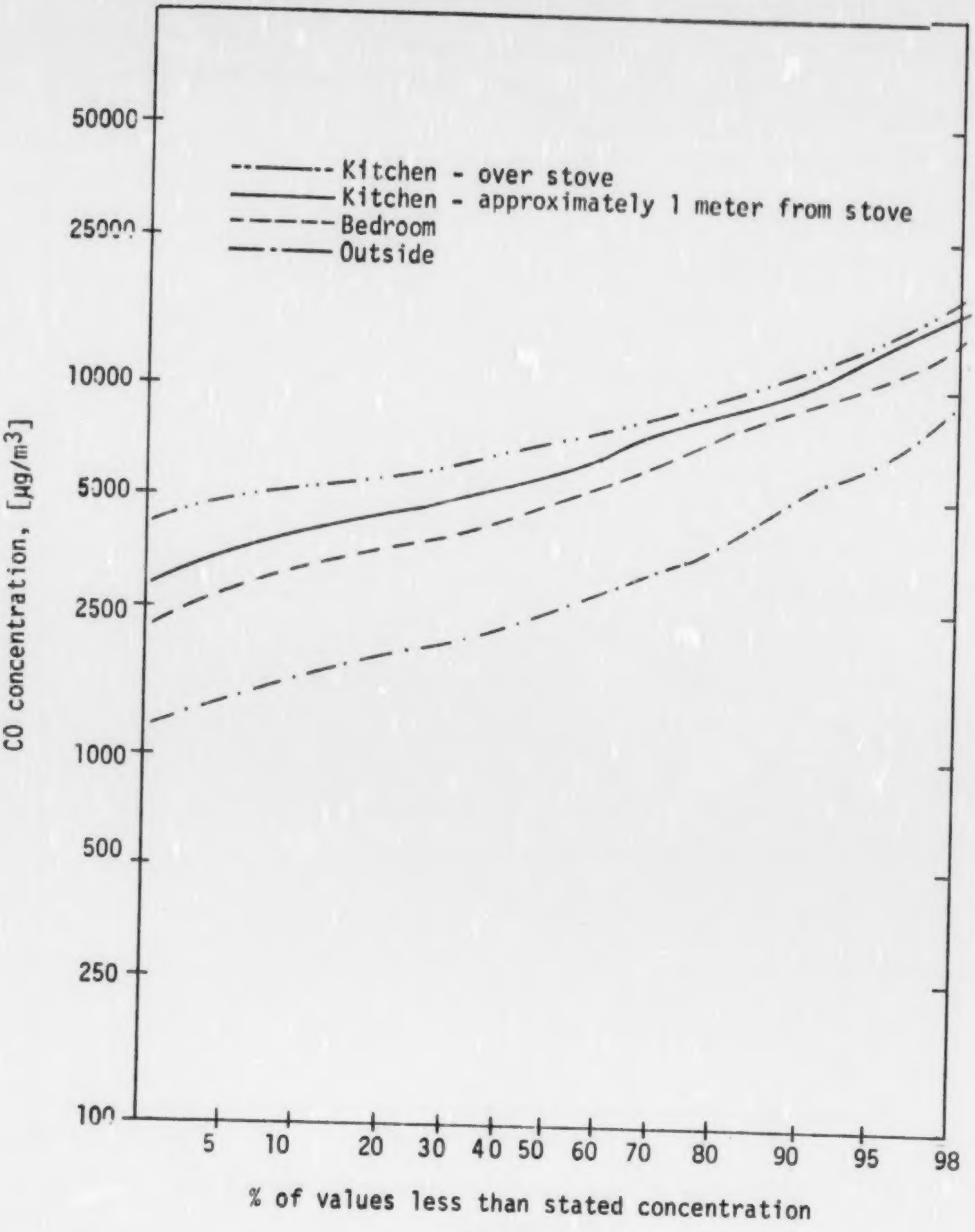

FIGURE 4-29

House No. 3 - Frequency Distribution of CO Concentrations, Five-minute Data Fall, 1973, 2nd half of period grouped indoor distribution curves as related to the outdoor curves in the fall than in the spring. This result is probably the result of the more closed up attitude of the house in the fall as compared to the spring.

4.4 House No. 4 - Suburban Ranch Home

We chose this house to replace House No. 2 for the fall-winter 1974 sampling period. The following locations were selected for the entire two week sampling period at this house:

Station 1.	Kitchen-above the stove
Station 1A.	Kitchen-1 meter from the stove, over the sink
Station 2.	Living Room
Station 4.	Outside

Sampling in one of the two bedrooms for half the test period was not possible because of the inconvenience it would have caused the residents.

4.4.1 Nitrogen Dioxide (NO_2)

Table 4-23 is a summary of the daily average NO_2 and stove use data for seven complete days during the winter sampling period. The overall average NO_2 concentration in the kitchen, 213 $\mu g/m^3$, was the highest for all the houses tested in this task. This overall average was approximately 5.5 times greater than the outdoor NO_2 level of 39 $\mu g/m^3$. As we found from sampling at the other three houses, the NO_2 levels indoors are increased by stove usage. Stove age and condition are also factors contributing to the high NO_2 levels at House No. 4. The level of stove activity, an average of 66 oven minutes and 73 burner minutes per day, was one of the highest that we encountered in the field sampling program. Stove use in

TABLE 4-23

Winter (1974) Sampling at House No. 4

DAILY AVERAGE NO_2 CONCENTRATION AND STOVE USAGE DATA

Date	Daily Average NO_2 Concentration ($\mu g/m^3$)				Total Stove Use (Min)	
	1-Kitchen Over Stove	1A-Kitchen 1 M. From Stove	2-Living Room	4-Outside	Oven	Burners
1/31/74	177	103	83	70	65	38
2/01/74	187	106	53	23	91	104
2/02/74	197	78	54	25	30	64
2/07/74	246	173	135	42	131	73
2/09/74	194	136	90	38*	10	57
2/10/74	189	123	84	44	0	68
2/14/74	304	200	136	32	135	110
OVERALL DAILY AVERAGE	213	120	71	39	66	73
Overall NO_2 Average:						
1. As % of Maximum Kitchen Level	100	56	33			
2. As % of Remote Kitchen Level	——	100	59			
3. Indoor/ Outdoor Ratio	5.46	3.08	1.82	1.00		

* Based on 11 out of 12 valid 2-hour values.

House No. 1 was higher than this level in the spring, but fall stove use in House No. 1 was about the same as the winter use level in House No. 4.

The daily average NO_2 concentrations were generally highest on days of high stove activity. Another factor affecting the indoor average NO_2 levels was the corresponding concentration outside, but such an effect could not be established with precision based on the available data.

Comparison of the twenty-four hour averages for each of the four sampling locations shows a sharp decline in NO_2 levels within a short distance from the stove. Station 1A was 1 meter from the stove and the average NO_2 concentration decreased 44% from the levels measured directly above the stove. We did not observe this sharp drop in NO_2 within the kitchen (comparing concentrations at Station 1 with Station 1A) at either House No. 1 or No. 3 and initially believed that the outside door located close to the stove was diluting stove effluents since neither of the other houses had this configuration. However, as we shall see later this apparent dilution effect did not show up with either NO or CO. Therefore, the outside kitchen door cannot be considered as an important factor in affecting the pattern of indoor concentrations in House No. 4. We believe that the rapid disappearance of NO_2 generated by the stove in this house is enhanced by mechanisms such as adsorption, absorption and reactions which are not present in the other houses. One possible explanation might be the effect of high humidity within the kitchen of this house. Sampling was done during cold weather when the house was tightly closed, and with the considerable amount of cooking done in this house, the relative humidity in the kitchen could have been quite high which in turn might have enhanced the disappearance of NO_2 by one of several mechanisms. The relative higher temperature in the kitchen should not be discounted as a contributory factor.

Figure 4-30 shows the diurnal pattern of NO_2 concentrations in House No. 4 in winter. This graph like the others of this type presented earlier

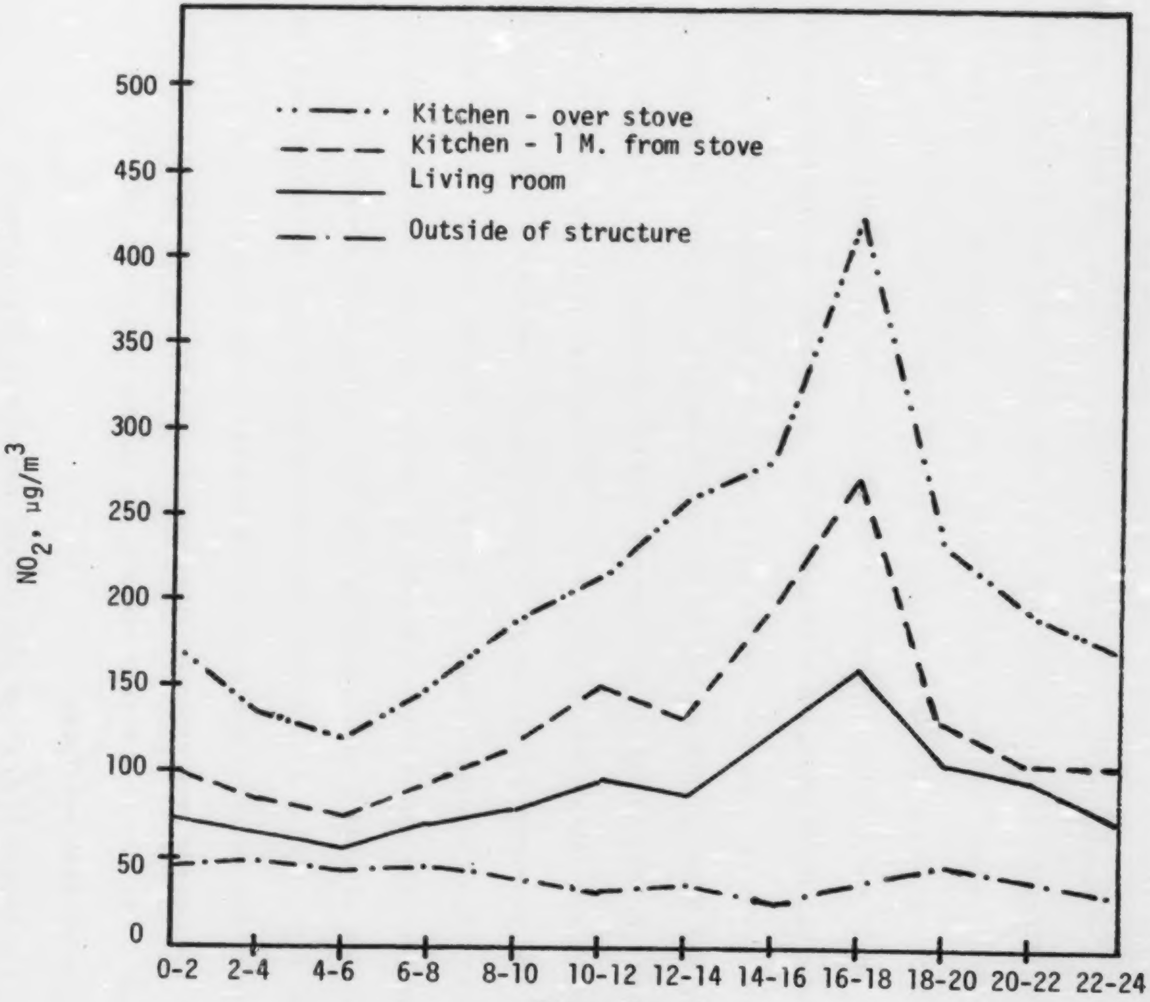

FIGURE 4-30

Diurnal Indoor/Outdoor Pattern for NO_2 - House No. 4, Winter, 1973
(Composite day based on 7 days of data)

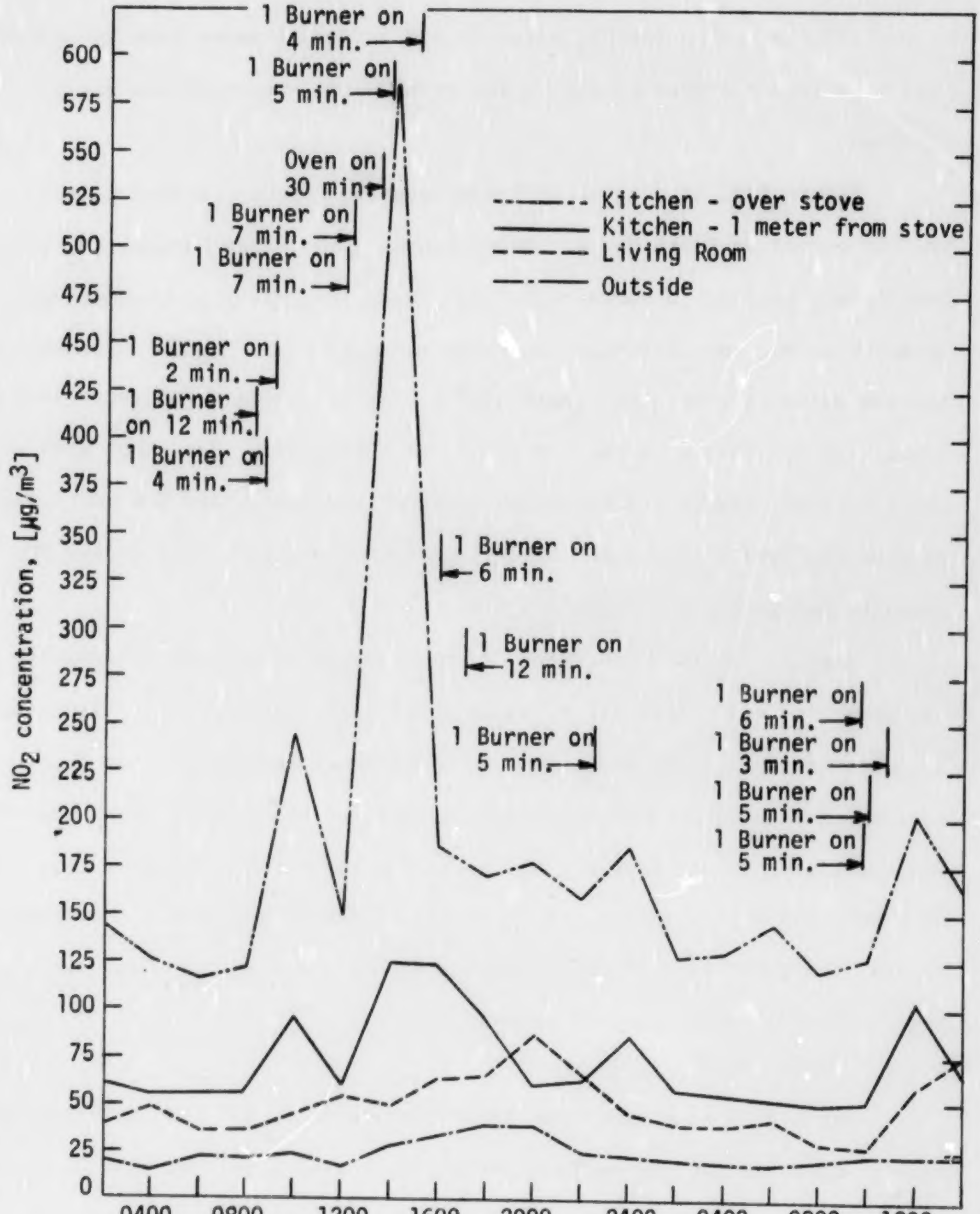

FIGURE 4-31

House No. 4 - A Time History of NO_2 Concentrations, 2-Hour Averages

Winter, 1974

for House No. 1 (Figures 4-1 and 4-2) are based on a "composite day" developed from 7 days of data. This graph shows the dominant influence of the peak associated with preparation of the evening meal. We are not able to explain the dip in the NO_2 value in the kitchen 1 meter from the stove (and to a lesser degree in the living room) which occurs in the early afternoon.

Figure 4-31 is a graph of 2-hour average NO_2 concentrations for a typical period at House No. 4. As we found at the other houses, NO_2 levels immediately respond to stove activity. This stove use also becomes readily apparent as NO_2 concentrations increase throughout the house. Periods of intense activity generally create higher concentrations. But these peak levels did not persist after the stove was turned off. The graph also shows the distinctly higher concentration found at Station 1, and the more closely related NO_2 levels elsewhere indoors. A complete list of the 2-hour NO_2 averages can be found in Appendix B-6.

Figure 4-32 is a frequency distribution of all of the five-minute averaged NO_2 data. This distribution shows that 70% of all the five-minute NO_2 data in the kitchen above the stove was in excess of 100 $\mu g/m^3$. Note that there is a logical separation of curves for the kitchen (over the stove) and the living room. However, the curve for the kitchen location near the door does not have a logical relationship to the others. As we mentioned before, the rapid loss of NO_2 between Stations 1 and 1A for unexplained reasons causes this apparent anomaly.

4.4.2 Nitric Oxide (NO)

Table 4-24 summarizes the daily average NO levels and the stove use data at House No. 4. As we found with NO_2, the NO levels at this house were the highest we encountered in the field sampling program. NO levels at Station 1 averaged 14 times greater than those outside. As with NO_2 these high average NO concentrations are caused primarily by the high levels of stove activity with stove age as a contributing factor also. A complete listing of the 2-hour average NO concentrations can be found in Appendix B-6.

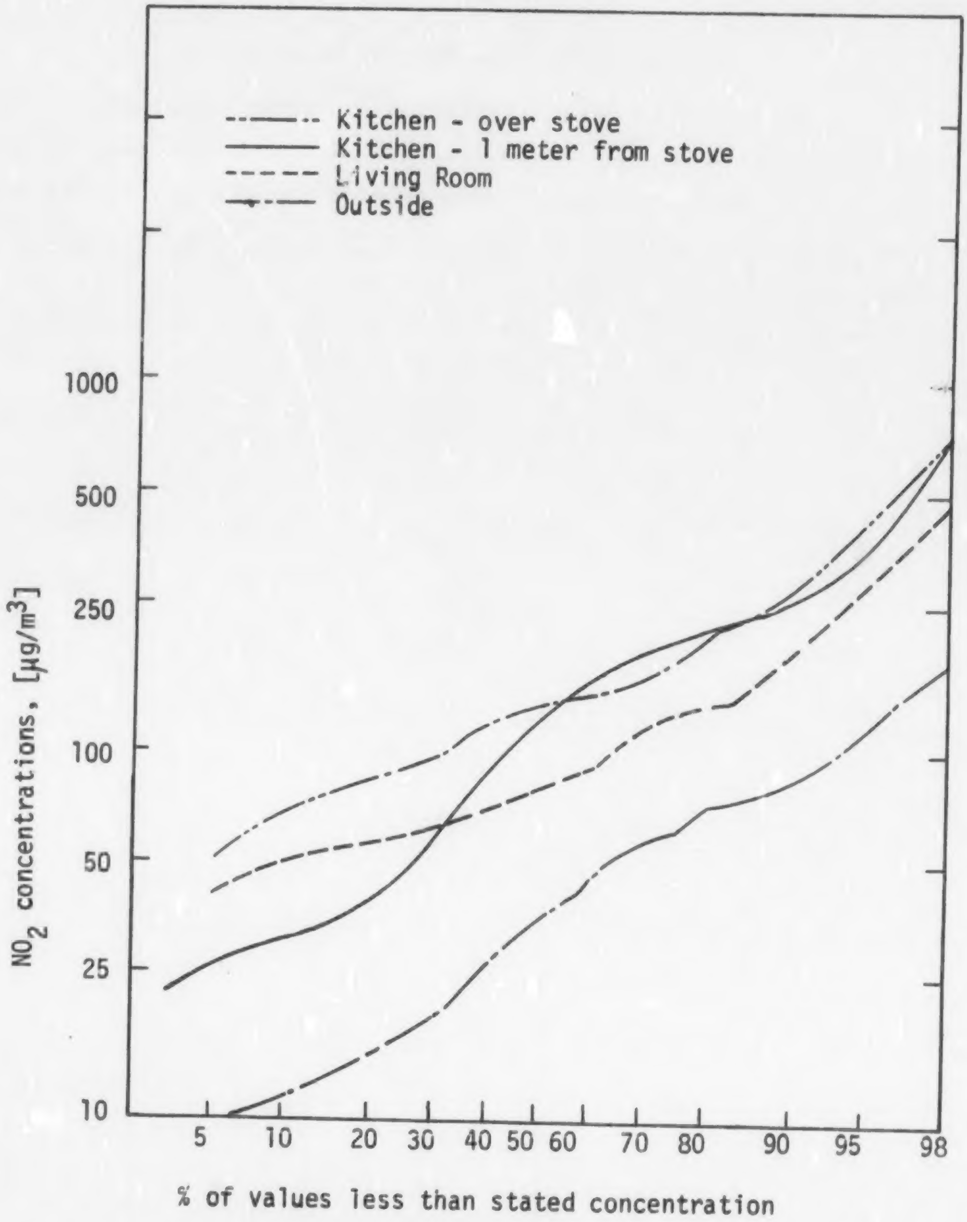

FIGURE 4-32

House No. 4 - Frequency Distribution of NO_2 Concentrations, Five-minute Data
Winter, 1974

TABLE 4-24

Winter (1974) Sampling at House No. 4

DAILY AVERAGE NO CONCENTRATION AND STOVE USAGE DATA

Date	Daily Average NO Concentration ($\mu g/m^3$)				Total Stove Use (Min)	
	1-Kitchen Over Stove	1A-Kitchen 1 M. From Stove	2-Living Room	4-Outside	Oven	Burners
1/31/74	322	272	150	33	65	38
2/01/74	264	212	95	12	91	104
2/02/74	281	222	127	8	30	64
2/07/74	410	386	352	19	131	73
2/09/74	224	185	160	24	10	57
2/10/74	236	198	177	16	0	68
2/14/74	400	352	323	21	135	110
OVERALL DAILY AVERAGE	305	229	156	19	66	73
Overall NO Average:						
1. As % of Maximum Kitchen Level	100	75	51	6		
2. As % of Remote Kitchen Level	—	100	68	8		
3. Indoor/Outdoor Ratio	16.1	12.1	8.2	1.00		

The conservative behavior of NO as compared with NO_2 is demonstrated by comparing the relationships of living room to kitchen (over the stove) for NO with NO_2 as shown in Tables 4-24 and 4-23. The living room value for NO is 51 per cent of the kitchen value, and for NO_2 the living room value is only 33 per cent of the kitchen value.

Figure 4-33 is a graph of the two-hour average NO concentrations for the same time period as shown for NO_2 in Figure 4-30. Comparing these two graphs shows peaks occurring in the same time periods of stove use. However, NO obviously does not decay as rapidly as NO_2 as stove effluents diffuse through the house. This confirms our previous findings in the diffusion experiment we conducted at House No. 2 in which the NO half-life was about three times greater than the half-life of NO_2. The two-hour NO averages indoors are much more closely related than shown for NO_2. They are also much higher than the outdoor NO levels during this time period.

A frequency distribution of all five-minute averaged NO data is shown in Figure 4-34. The most striking characteristic shown in this graph is the wide separation between indoor and outdoor concentrations. With all three indoor locations having basically similar occurrences of any given NO concentration, our earlier observations are further substantiated.

4.4.3 Carbon Monoxide

The daily average carbon monoxide concentrations at House No. 4 are presented in Table 4-25. As we found in the case of NO, carbon monoxide levels were exceedingly high indoors. The overall average CO concentration above the stove was approximately 3.8 times the overall average measured outdoors. This is substantially higher than we found at the other three houses. Carbon monoxide levels at House No. 4 appear closely related to stove use. The stove as the primary cause of high indoor CO levels can be seen by comparing the daily average concentration for February 1 and February 2. On February 1 the outdoor CO concentration was somewhat lower than that on February 2, yet kitchen concentrations

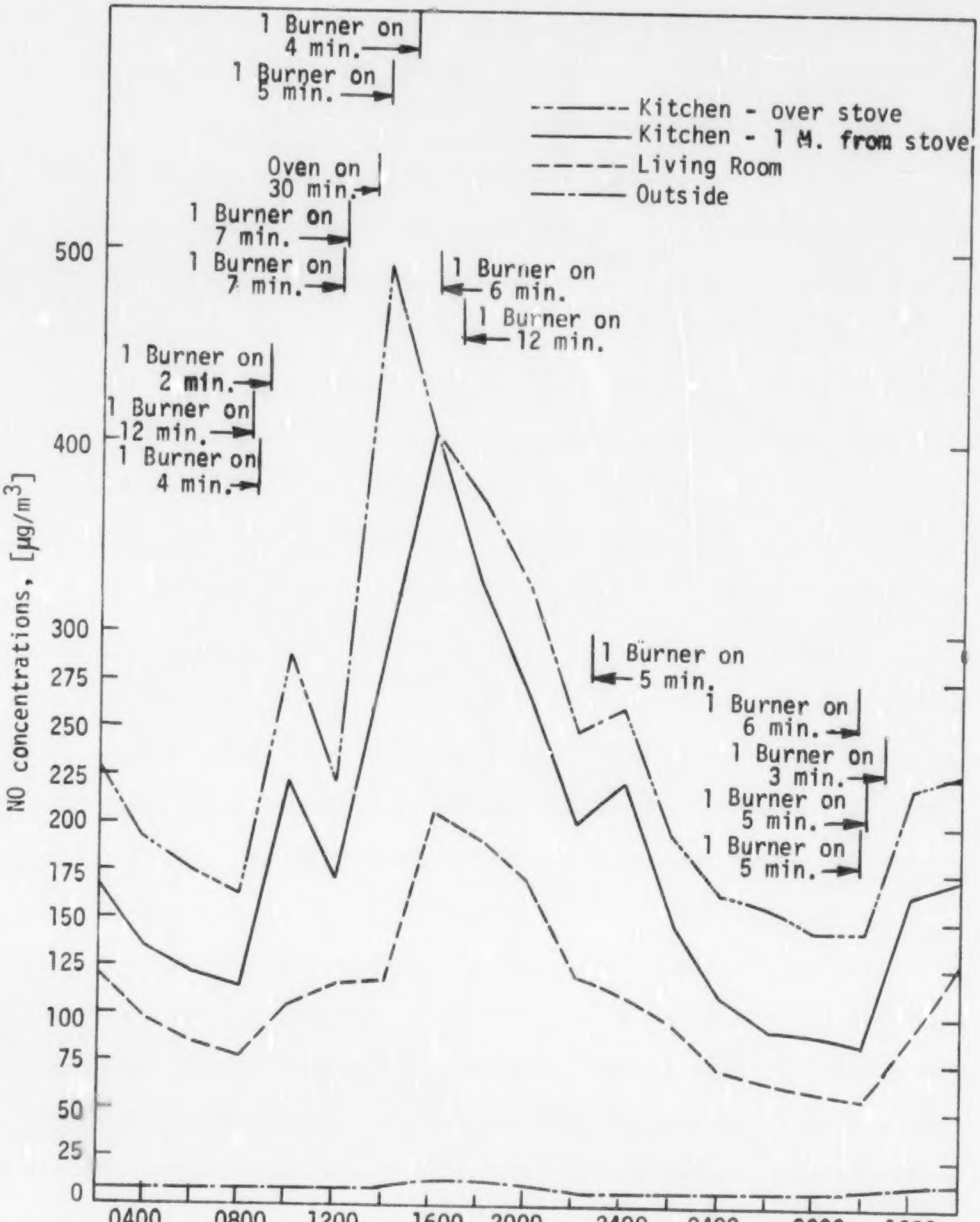

FIGURE 4-33

House No. 4 - A Time History of NO Concentrations, 2-hour Averages

Winter, 1974

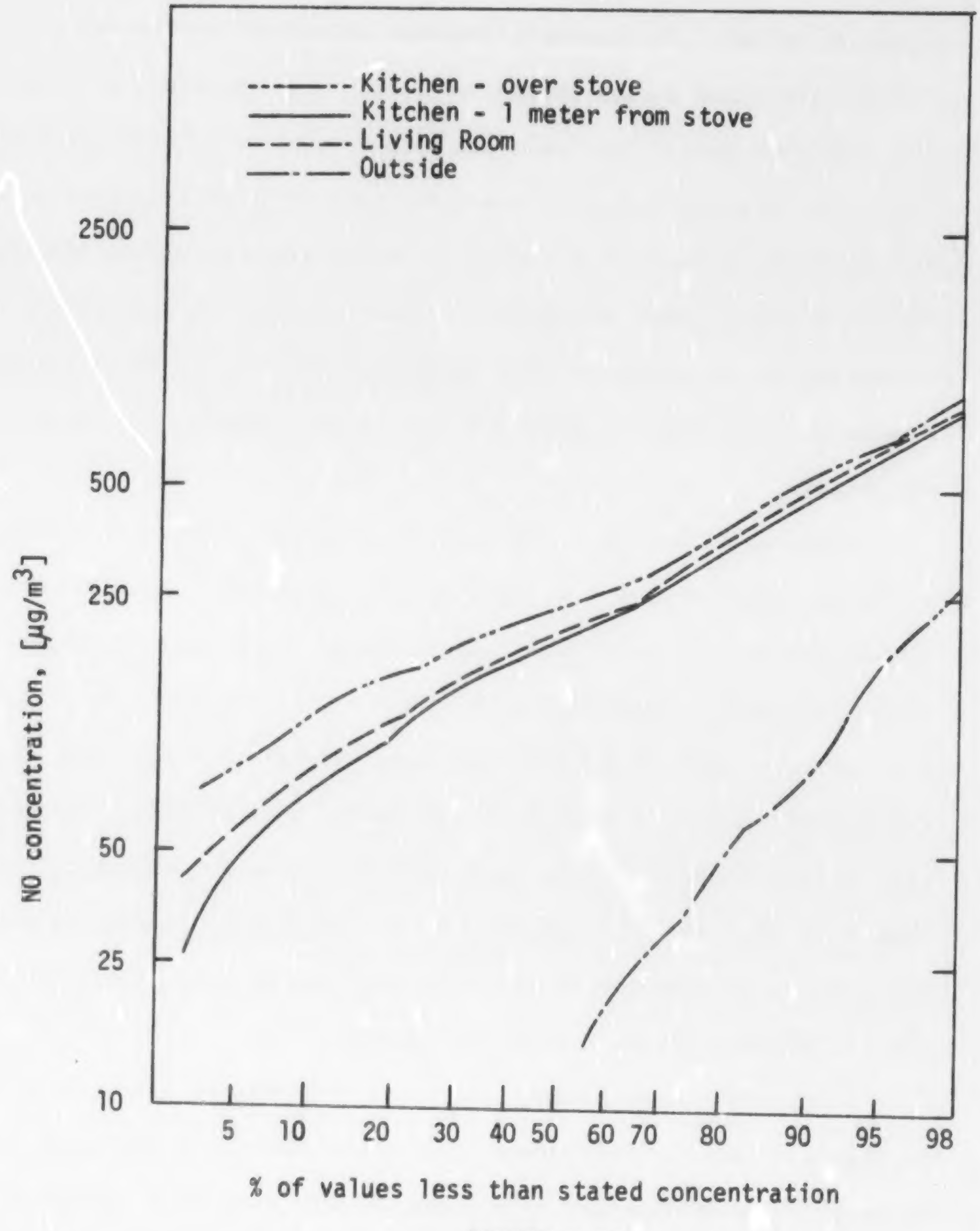

FIGURE 4-34
House No. 4 - Frequency Distribution of NO Concentrations, Five-minute Data
Winter, 1974

(over the stove) were higher on the 1st as compared to the 2nd because of the higher stove use. The interplay between indoor and outdoor CO concentration is probably minimized during the colder season when the house is closed up. At this time, the indoor CO levels are more responsive to stove activity.

The behavior of carbon monoxide shows it to be even more persistant than NO. As shown in Table 4-25 indoor CO levels averaged within 90% of the concentration directly above the stove. On several days the average CO concentration was higher at the remote kitchen location than directly above the stove. The reasons for this are not clear and some characteristics of the specific situation are unknown.

Figure 4-35 shows a time history of 2-hour average CO concentrations for a typical sampling period at House No. 4. This graph shows clearly the conservative nature of CO especially when compared to the time histories for NO_2 and NO for the same period (Figures 4-31 and 4-33). In fact, the CO time histories for the three indoor locations are almost identical and distinctly separate from the outside values. Figure 4-35 also shows the increases in CO levels with stove use. Carbon monoxide levels decrease after stove use more slowly than NO_2 but similar to NO. The CO concentrations at the indoor sampling locations appear to increase and decrease in unison with incidents of stove use. The compilation of all the two-hour CO averages is in Appendix B-6.

Frequency distributions of all the five-minute averaged CO data are shown in Figure 4-36. In this format of data evaluation, we see again the similarities between CO and NO (compare with Figure 4-34). All three indoor CO levels correspond closely and are distinctly higher than the outside values. Approximately 40% of the indoor concentrations are in excess of 10,000 $\mu g/m^3$.

TABLE 4-25

Winter (1974) Sampling at House No. 4

DAILY AVERAGE CO CONCENTRATION AND STOVE USAGE DATA

Date	Daily Average CO Concentration ($\mu g/m^3$)				Total Stove Use (min)	
	1-Kitchen Over Stove	1A-Kitchen 1 M. From Stove	3-Living Room	4-Outside	Oven	Burners
1/31/74	8650	8530	7730	2390	65	38
2/01/74	9150	8890	8020	2010	91	104
2/02/74	8860	9210	8450	2500	30	64
2/04/74	8870	9470	8430	2300	0	233
2/05/74	10840	10910	9790	4070	140	188
2/14/74	8710	7690	7180	1190	135	110
OVERALL DAILY AVERAGE	9070	9000	8190	2410	85	116
Overall CO Average:						
1. As % of Maximum Kitchen Level	100	99	90	27		
2. As % of Remote Kitchen Level	---	100	91	27		
3. Indoor/ Outdoor Ratio	3.76	3.73	3.40	1.00		

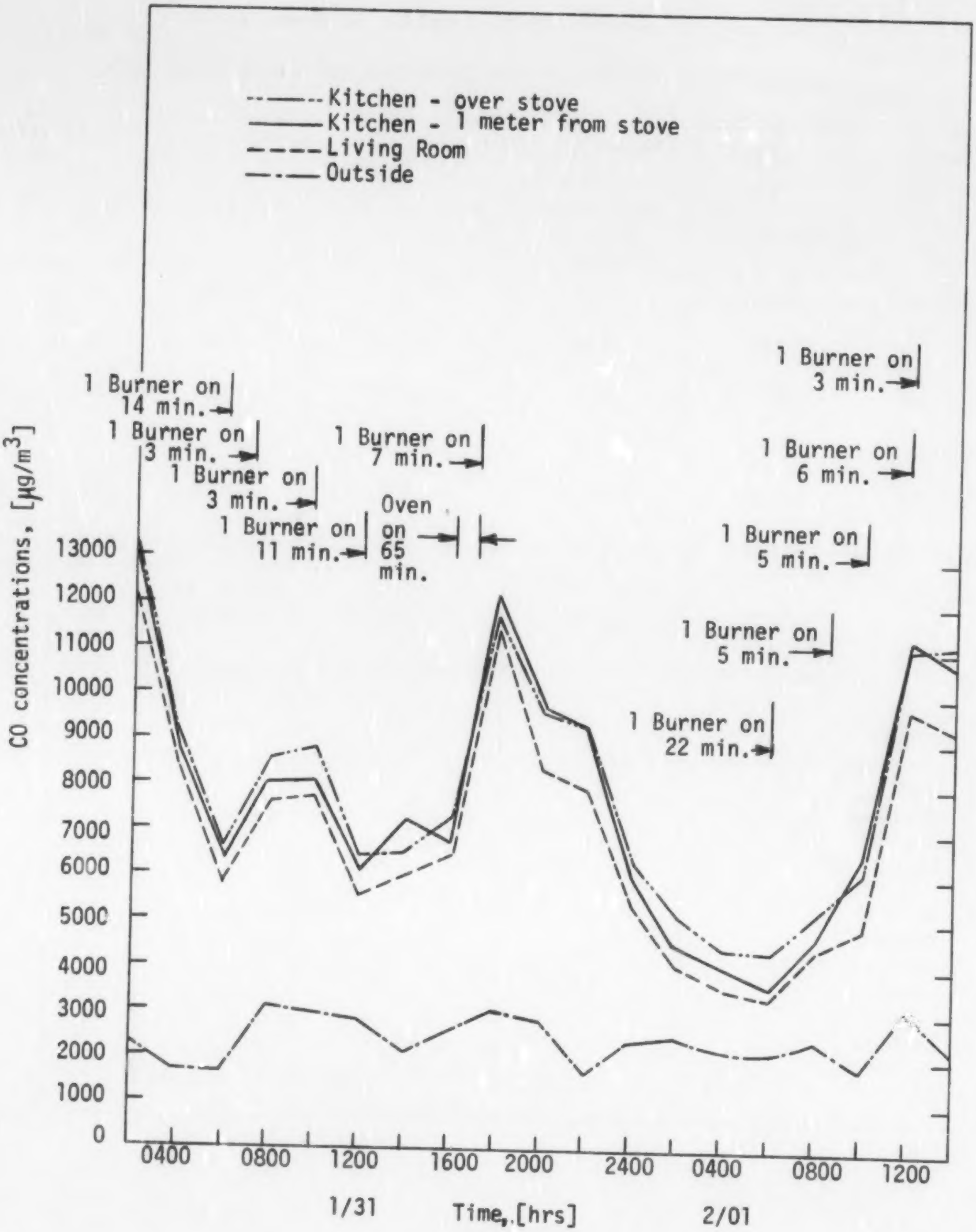

FIGURE 4-35

House No. 4 - A Time History of CO Concentrations, 2-hour Averages Winter, 1974

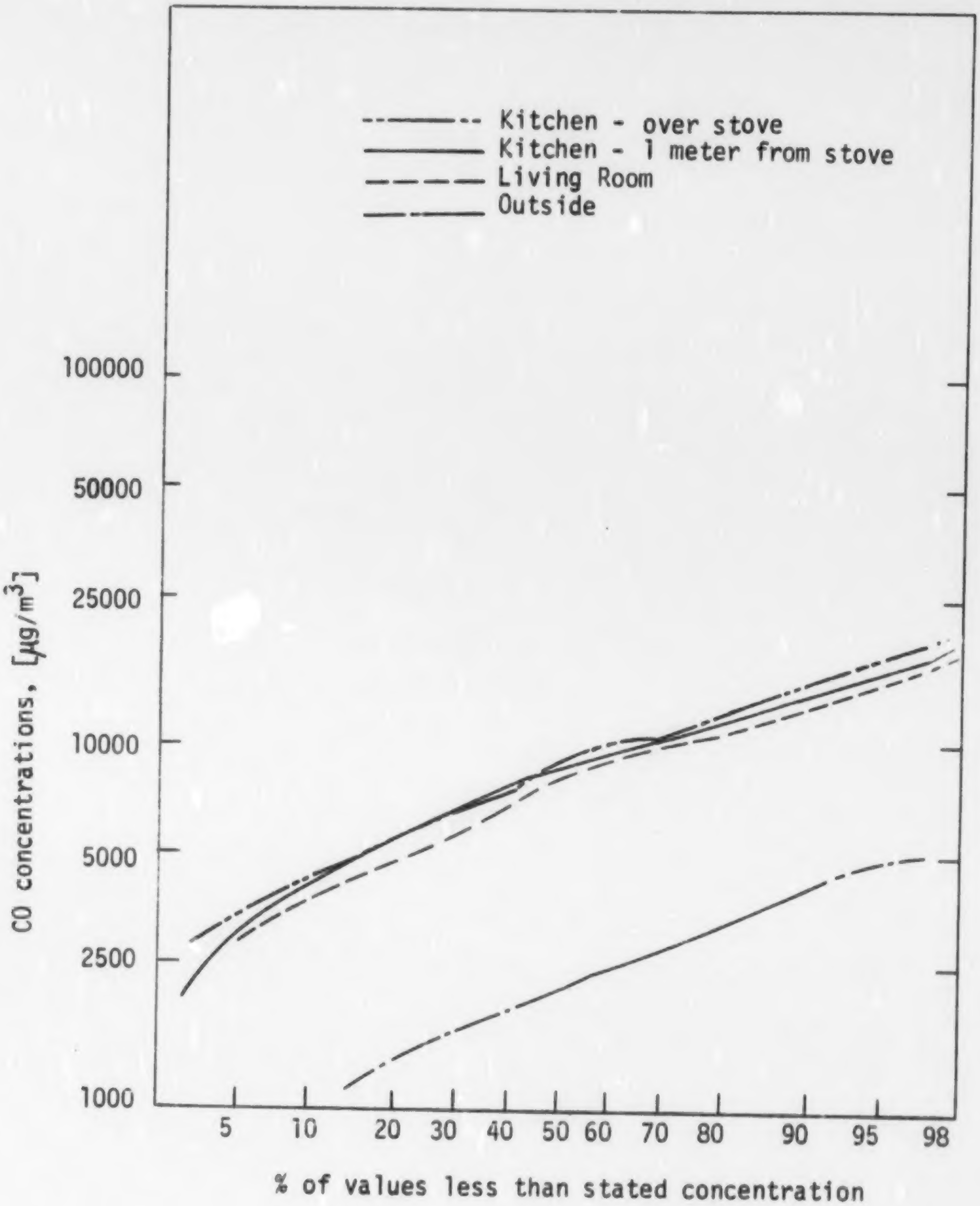

FIGURE 4-36

House No. 4 - Frequency Distribution of CO Concentrations, Five-minute Data

Winter, 1974

TASK 3

INVENTORY OF INDOOR SOURCES

TASK 3 - INVENTORY OF INDOOR SOURCES

1.0 INTRODUCTION

The purpose of this task is to identify actual and potential sources of indoor air contamination other than gas stove emissions. These sources were to be identified in two of the homes where indoor/outdoor sampling was carried out. Then, based on the results of this general and preliminary survey, those source categories judged to be important in determining indoor air quality and which could be quantified were to be studied in greater detail by an analysis of their activities in the homes of TRC employees.

In the course of the study we determined that the indoor source other than gas stoves which appeared to be most significant and was amenable to quantification was the use of aerosol products. Therefore, the bulk of this task was devoted to this indoor source category.

2.0 SUMMARY AND CONCLUSIONS

We have carried out a two-phase study to identify and, to the extent possible, quantify sources of indoor air contamination. We found that potential indoor sources take many forms. The emissions characteristics are highly variable and are related to a wide range of household operations. The one category of source found to be common to the households surveyed and which promised to be reasonably quantifiable was the use of products dispensed as aerosols by propellants.

Estimates were made for emissions of propellants into indoor atmospheres based on a survey of aerosol use patterns among TRC employees.

From the results of this work we draw the following conclusions:

1. Indoor sources of air contamination take many forms and are highly variable as to location in the home, intensity and frequency.
2. Quantification of indoor emissions of air contaminants is not straightforward and much more work is needed in developing appropriate emission factors.
3. The most common and important sources of indoor air contamination were identified as:
    a. Smoking
    b. House cleaning activities
    c. Cooking
    d. Use of aerosol products
4. Of the important source categories identified, the only one whose quantification could be attempted within the scope of this study was use of aerosol products.

5. A wide range of "active" ingredients and to a lesser extent propellants are used in aerosol form. We were able to determine typical active ingredients for many aerosol products but not specific quantities of each ingredient. For this reason no quantitative estimates of emissions were made for the active ingredients.
6. Fluorocarbon propellants are used in an estimated 75 percent or more of the aerosol products. Other propellants are used but in much smaller quantities.
7. Based on aerosol use data in a survey of TRC employees, we conclude that propellant concentrations in the home are usually well below the TLV's for these materials. However, combinations of circumstances could produce concentrations approaching or exceeding these levels.
8. The co-existence of aerosol product active ingredients, propellants, and contaminants from other sources in the home could produce an environment capable of producing adverse health effects. This whole area needs further study.

3.0 SURVEY RESULTS

3.1 Preliminary Interviews and Inspections

The two houses chosen for a generalized survey in indoor sources were House Nos. 1 and 3. A general description of their lay-out and other physical aspects is included in the Task 2 report.

In surveying the two houses, we used a list of possible sources of indoor air contamination as a basis for our interviews with the homeowners. This list is shown as Table 3-1.

Table 3-2 presents the results of interviews with the householders in Houses 1 and 3 based upon the format presented in Table 3-1. As one might expect, there is considerable variability in the habits and practices in these two homes which are capable of creating indoor air contamination. We discussed this survey with many TRC employees and determined that the variability (in character, time, degree and location) in practices which can cause indoor air contamination is typical.

Many of the sources were deemed to be extremely intermittent (e.g., interior painting) or so variable in nature (e.g, hobby and home repair activities),at least among TRC employees, that further detailed considerations within this task would have yielded little useful information. We also found that the incidence of smokers among the TRC staff and their families was extremely low (less than 10%) and pursuing this potential source in detail within the population under study would have yielded little information.

We identified cooking, cleaning and the widespread use of products dispensed with propellants as important and common sources of indoor air contamination. The first two source categories can take many forms.

TABLE 3-1

CHECK LIST FOR IDENTIFICATION OF INDOOR SOURCES OF AIR CONTAMINATION

1. Personal habits of individuals
   a. Smoking
   b. Use of spray products such as hair sprays, deodorants, shaving foam, etc.
2. House cleaning
   a. Vacuuming, sweeping and dusting
   b. Use of liquid (solvent) waxes and cleaning agents.
   c. Use of spray products such as air fresheners, disinfectants, oven cleaners, etc.
3. Cooking
   a. Stove use (included in Task 2)
   b. Types and quantities of foods cooked and methods used.
4. Household maintenance
   a. Painting of house interior with solvent, water-based and aerosol spray paints.
   b. Home workshop projects (sawdust, glue solvents, soldering and brazing, etc.).
   c. Automobile repair in attached or in basement garage.
5. Hobbies
   a. Model airplane (glue and dope)
   b. Photographic dark room (So_2 from Hypo, etc.)
   c. Woodworking (particulates, solvents, etc.)
6. General
   a. Attached or basement garage
   b. Use of electric motors (NO_x, O_3)

TABLE 3-2

SUMMARY OF INDOOR SOURCES AT TWO TEST HOMES

Source Category	House No. 1	House No. 3
	(Surburban Split Level with basement-8 years old-attached garage-4 occupants)	(town-house with basement-2 years old-apartment-no attached or basement garage-4 occupants)
Smoking	Wife smokes, 1 pack/day	No smokers in family
Personal Products	Men use spray deodorants. Women use creams, used in morning.	Spray deodorants used - no hair spray or shaving foams.
Cleaning	Vacuum rugs every other day-kitchen floor swept every day-House dusted 2 to 3 times a week, aerosol dust spray and rug cleaners used.	Vacuuming, sweeping and dusting on erratic schedule-usually 1 to 2 times a week. Household spray products limited to disinfectants, oven cleaners, and furniture polish.
Cooking	Gas stove-mostly roasting and baking. Most meals prepared and eaten at home.	Gas stove - mostly roasting and baking, very little frying done.
Household Maintenance	Interior painting done as needed (roughly yearly) Usually spring or fall.	Painting done yearly by apartment owner.
Hobbies	Very limited indoor hobbies.	Wife paints using a variety of media.
Basement and/or Garage Activities	Auto repair and lawn mower maintenance in attached garage. Lawn mower and auto started in garage.	Extensive use of basement for spray finishing of pictures (art), refinishing of furniture and woodworking.
Use of Electrical Appliances	Toaster used daily, blender seldom used, can opener, hair dryer and stylers electric razors, electric frying pan, television and radios.	Can opener and blender (seldom used) hair dryer, sewing machine used frequently, electric dryer, television and stereo.

Quantification of these indoor emissions could only be determined by means of laboratory and field measurement programs and developing adequate data on these relative importance in influencing indoor air quality would be outside of the scope of this project. Therefore, we identified the use of aerosol products in the home as the category to be studied further.

3.2 Aerosol Product Survey

The use of aerosol products was shown to be prevalent among the TRC employees interviewed. The variety of products dispensed from pressurized containers has grown remarkably in the past ten years or so and are associated with many household and personal care uses. Since the average family employs a significant number of aerosol products which directly dispense material into the home air environment, TRC decided to investigate further their emissions.

A checklist of common spray products was distributed among the employees at TRC and the responses from nearly 40 households were evaluated. Information was gathered on the usage habits (rate of use, time of use, and the frequency of use) from which estimates of the quantity of contaminants emitted to the indoor environment were obtained. We believe that this inventory represents a cross-section of middle-class Southern New England homes.

3.2.1 Design of the Survey

A check list was prepared and distributed among the employees at TRC. Information on the usage habits of each household with respect to aerosol products was recorded. The following product areas appeared on the check list:

Hair Sprays
Breath Sprays
Deodorant Sprays
Hair Removers
Perfumes & Cologne Sprays
Mouth Wash Sprays
Feminine Deodorant Sprays
Medicinal & First Air Sprays
Foot Sprays
Shoe Polish Sprays
Shaving Foams
Hair Coloring Foams
Air Fresheners
Window Cleaners
Dust Sprays
Fabric Finish Sprays
Anti-Static Sprays
Stain Repellents
Non-Stick Cooking Sprays
Oven Cleaners
Furniture Polish & Dust Spray
Spot Remover Sprays
Spray Starch
Rug Shampoo Sprays
Disinfectants
Tile Cleaners
Spray Waxes
Veterinary Products
Spray Paints
Craft Adhesives
Car Starters
Insect Repellents
Anti-Rust Sprays
Degreasers
Whipped Cream
Cheese
Cake Frostings

We noted the usage rates, location of use, and the frequency and time of use for each product used by the households interviewed. Information regarding the makeup of the households was also recorded.

3.2.2 Results and Discussions

General Characteristics

The inventory consisted of responses from approximately 40 households which represent essentially half of TRC's employees. Statistics on the households appear in Table 3-3.

Usage habits of aerosol products among the households surveyed showed that essentially all families use some aerosol spray product of one kind or another. The data showed that an average of 10 product categories are used by each household. Table 3-4 presents the most frequently reported aerosol products. Six of the nine categories appearing come under the heading of household cleaning aids. This is of particular consequence since this would necessarily subject the housewife to a good number of potential air contaminants during the course of the day. Another major class of spray products is the Personal Care Category with contributions from deodorant sprays, hair sprays, and shaving foams.

TABLE 3-3

DATA ON HOUSEHOLDS FOR AEROSOL USE SURVEY

Type of Residence:	
Apartment	55%
House	45%
Number of Persons in Household:	
1	18%
2	40%
3	8%
4	24%
5	5%
>5	5%
Size of Residence (No. of Rooms):	
3	10%
4	16%
5	26%
6	13%
7	16%
8	11%
>8	8%

TABLE 3-4

AEROSOL PRODUCT CATEGORY USE FOR TRC HOUSEHOLDS

Product Category	Percentage of Households using this Product
Furniture Polish	84%
Deodorant Spray	74%
Hair Spray	71%
Disinfectant Sprays	63%
Window Cleaners	47%
Shaving Foams	45%
Oven Cleaners	42%
Air Fresheners	26%
Dust Sprays	18%

Emission Characteristics

Some aerosol products are limited or confined to specific locations of use in the house. Others are used throughout the residence. The time, frequency, and rate of use are also shown to vary among spray products. For the most part, deodorants and shaving foams are most heavily used in the bathroom in the early morning before work or school and possibly at night before bed. Most members of the family will be present at their time of use. Hair sprays are applied on a less frequent schedule. Housecleaning is generally performed a few times per week, in the morning or afternoon. Chores such as cleaning the oven are done at greater intervals. In any case, the housewife and any pre-school children would be exposed to aerosol contaminants from household spray products.

Usage patterns and rates for the aerosol products appearing in Table 3-4 are presented in Table 3-5. The quantities of materials used are based on the numbers of various sizes of cans of a product which the householder reported using. Window cleaners were not listed and were not considered further since we found that a significant portion of their use is likely to be out-of-doors.

Propellant Emission Estimates

Most spray systems consist of two components: Functional or "active" ingredients and the propellant. The functional ingredients comprise the cleaning agents, perfumes, solvents, polishing waxes, disinfectants, etc. Propellants are used to dispense the functional portion from the container. Although the exact proportions and ingredients used in aerosol products are proprietary information, TRC was able to determine the majority of ingredients for the most frequently used

TABLE 3-5

AEROSOL USAGE PATTERNS

Product Category	Frequency of Use	Time of Use	Location of Use	Average Usage Rate for Household g/mo.	Weight Fractions of Propellant %
Deodorant Spray	Once or Twice a Day	Early Morning Late Evening	Bathroom	112-140	40
Hair Spray	3 times per week	Morning or Evening	Bathroom	84-112	70
Shaving Foam	Once a day	Morning or Evening	Bathroom	84-112	10
Air Fresheners	Once a Week	Morning-Afternoon	Throughout House	28-56	80
Disinfectant Sprays	3 times per week	Morning-Afternoon	Kitchen, Bathroom	112	80
Furniture Polish Sprays	Once a week	Morning-Afternoon	Living Room, Bedrooms, Dining Room	56	60
Dust Sprays	Once a week	Morning-Afternoon	Living Room, Bedrooms, Dining Room	28-56	60
Oven Cleaners	4 times per Year	Afternoon	Kitchen	84	10

products in Table 3-4 with the exception of dust sprays. Table 3-6 shows the wide variety of active ingredients that can be packaged in aerosol form. Because of the diversity of compounds used as ingredients, the lack of any information about the quantity of each ingredient in a single product and the amounts of active ingredients actually used versus the amount emitted to the atmosphere, we did not attempt to quantify the emission of active ingredients to the indoor atmosphere. It is our judgement the impact of the active ingredients can only be determined from a well-designed measurement program, which was beyond the scope of the present study.

There are a number of propellants used as well as shown in Table 3-6. Of those listed, however, the Freons appear to predominate in use. Isobutane is used in some window cleaners, propane, methylene chloride and vinyl chloride are used in a few hair sprays and nitrous oxide is used in some shave creams and food products. Although we did not develop any conclusive propellant usage data, we estimate that Freon propellants are used in at least 75 percent of the aerosol products. For this reason in estimating propellant emissions we have assumed that the propellants are fluorocarbons.

By focussing on fluorocarbon propellants we are not suggesting this is the only class of compounds worth examining. Until we can more accurately determine the amount of active ingredients emitted to the indoor atmosphere and the usage of propellants other than fluorocarbons, quantitative assessments of their impact would be speculative.

Emission estimates are a function of the rate of use, frequency of use, and the proportion of propellant in the spray container. Taking for an example the information appearing in Table 3-5 for deodorant sprays, and making certain assumptions, it is possible to compute the approximate quantity of propellant

TABLE 3-6

TYPICAL ACTIVE INGREDIENTS AND PROPELLANTS FOR FREQUENTLY USED AEROSOL PRODUCTS

Product Category	Active Ingredients
Furniture Polish	Silicone, wax, morpholine
Deodorant Spray	Hydrated aluminum chloride, isopropyl myristate, talc, triglycerides
Hair Spray	Vinyl acetate copolymer resins, polyvinyl-pyrrolide resins, ethanol, lanolin
Disinfectant Sprays	Triisopropanolamine, morpholine
Window Cleaners	Sodium nitrite, isopropyl alcohol, ethylene glycol, ammonium hydroxide
Shaving Foams	Stearic acid, triethanolamine, menthol, glycerine
Oven Cleaners	Potassium hydroxide, hydroxyethyl cellulose polyoxyethylene fatty ethers
Air Fresheners	Proplylene glycol, morpholine, ethanol

Propellants

Freon - 11)
Freon - 12) Chlorinated fluorocarbons
Freon - 114)

Isobutane, propane, nitrous oxide, methylene chloride, vinyl chloride emitted into the indoor atmosphere during each individual use. If we assume that the deodorant is used in a household with three occupants, and that each occupant uses a deodorant product every other day (this is generally consistant with the inventory data shown in Table 3-5) the number of individual uses each month will be 45. At 40% propellant, the amount of propellant emitted during each individual use can be computed as follows:

$$\frac{(112 - 140 \text{ g/mo}) \times .40 \text{ (fraction propellant)}}{45 \text{ uses/mo}} = 1.0 \text{ to } 1.2 \text{ g/mo}$$

Application of this estimating technique to the other aerosol products resulted in the emission quantities appearing in Table 3-7.

An experiment conducted at TRC was performed to validate data from the inventory. Several brands of deodorant were tested to determine the dispensing rate of aerosol. Analytical measurements gave a range of .3-.9 g/sec. If we assume an average rate of .6 g/sec, 40% propellants and a typical use of 4 seconds, the amount of propellant emitted per use would be:

$$.6 \frac{\text{g}}{\text{sec}} \times .40 \times 4 = 1.0 \text{ g propellant/use}$$

This result is in excellent agreement with our inventory findings. We expect that information assembled on less frequently used products would be somewhat less reliable especially with respect to estimates of usage rate. Those spray products that are used regularly are likely to be more closely estimated.

Referring once again to Table 3-7, we note a wide range of propellant emission rates per household use for the aerosol products listed. Shaving foams are estimated to emit less than .5 grams of propellant per use, while a maximum emission of 25 grams/use was determined for oven cleaners. We have less confidence in the emission estimate for each use of oven cleaners than

TABLE 3-7

EMISSION ESTIMATES OF PROPELLANTS FOR AEROSOL PRODUCTS

Product Category	Propellant Emission Estimates (g/use)
Deodorant Sprays	1.0 - 1.2
Hair Spray	4.9 - 6.5
Shaving Foam	0.3 - 0.4
Air Fresheners Spray	5.6 - 11.2
Disinfectant Spray	7.5
Furniture Polish Spray	8.4
Dust Spray	4.2 - 8.4
Oven Cleaners	20 - 25

for some of the other products, because this material is used only infrequently. While the contamination of the indoor air relates to these emissions, the level of contamination will also be influenced by factors such as location of use, volume space of room, air circulation rate, contaminant half-life, and the specific design of the residence. Those products which are dispensed in small, poorly ventilated areas are not likely to disperse readily throughout the house yet they would be expected to contribute to relatively high initial concentrations within the room where they are dispensed. Aerosols which are employed throughout the residence under condition of adequate air circulation would result in somewhat lower initial room concentrations and decay more rapidly with time.

The nature and extent of indoor air contamination, as was indicated, is a function of many independent variables. Some limits and the scale of the problem may be obtained, however, by using the propellant emission data collected in our inventory and several appropriate assumptions. For the purpose of comparison, we will investigate three situations as described below:

(1) Case 1: Deodorant Spray Propellant, 1-2 g/use, dispensed in bathroom.

(2) Case 2: Air Freshener Spray Propellant, 8.4 g/use, dispensed throughout house

(3) Case 3: Oven Cleaner Propellant, 25 g/use, dispensed in kitchen.

If we assume that a deodorant spray is used in a tightly closed bathroom of $10m^3$ volume, we would expect that the initial concentration of propellant would be:

$$\frac{1.2}{10} = .12 \text{ g/m}^3 = 120{,}000 \ \mu\text{g/m}^3$$

Since fluorocarbons are extremely unreactive under ambient conditions, we would expect the half life of the material based on dispersion and dilution would be similar to that measured for CO in House No. 2 in Task 2, or roughly 2 hours. Thus, as long as someone remained in the closed bathroom, they would be exposed to concentrations at approximately this level.

If we assume that the amount of propellant from two sequential uses of aerosol deodorant is dispersed completely throughout a small house of 255 m^3 volume, the initial concentration would be:

$$\frac{1.2 \times 2}{255} \times 10^6 \approx 9400\ \mu g/m^3$$

Using a half life of two hours, concentrations after 8 hours would be about 600 $\mu g/m^3$.

Air freshener sprays are considered to be applied in most rooms of the house so that an initial concentration of propellant for the indoor environment is established quickly and for the most part uniformly.

$$\frac{8.4\ g}{255\ m^3} = .033\ g/m^3 \approx 33{,}000\ \mu g/m^3$$

With a 2-hour half-life, the average indoor concentration would be 2000 $\mu g/m^3$ after 8 hours.

Application of spray oven cleaners in the confines of the kitchen (assume a $22m^3$ volume) would possibly produce an initial room concentration of propellant as follows, assuming the kitchen is closed off from the rest of the house:

$$\frac{25\ g}{22\ m^3} = 1.14\ g/m^3 \approx 1{,}140{,}000\ \mu g/m^3$$

Assuming that contaminants from a single use would be rapidly dispersed throughout the whole house, the average propellant concentration would be:

$$\frac{25\ g}{255m^2} = 0.10\ g/m^3 \approx 100{,}000\ \mu g/m^3$$

After eight hours, the indoor concentrations in the house would be about 6,300 $\mu g/m^3$.

The Threshold Limit Values (TLV's) set by the American Conference of Governmental Industrial Hygienists for propellants of the types commonly used are in the approximate range of 5000 to 7000 mg/m^3. Thus, with the possible exception of oven cleaner use, none of the individual aerosol product use in the house appears to approach the TLV for propellant. However, depending on use patterns and in a given house, (e.g., simultaneous or sequential use of several products) indoor concentrations of propellants could exceed these limits on occasion. Furthermore, the active materials dispensed could add an unknown but probably significant component to indoor air contamination from these products.

Further research on the specific impact on indoor air quality of aerosol products and other activities identified above is clearly needed.

IV APPENDICES

APPENDIX A

CALIBRATION PROCEDURES FOR BENDIX NO/NO_x ANALYZER

CALIBRATION PROCEDURES
FOR THE BENDIX CHEMILUMINESCENT
NO & NO_2 ANALYZER

I. GENERAL

1. Allow instrument to warm up as long as possible, but at least 4 hours. Use the $NO/NO_2/NO_x$ mode at all times.

2. Set up calibration apparatus: Connect in order: 1) pump, 2) UV lamp, 3) scrubber, 4) ozone generator, 5) mixing chamber, and 6) output manifold. Connect the NO supply in the following order: 1) NO Cylinder, 2) pressure regulator, 3) capillary, and 4) valve for bubble flowmeter. The NO and air should join ahead of the mixing chamber.

3. Set the instrument's three range scales to the 0 to 0.5 ppm range.

4. Switch the instrument to zero, turn on zero ozone lamp on the zero air scrubber, and allow at least 10 minutes for stabilization.

5. Adjust the "NO_2 ZERO" knob until the NO_2 pen reads 5% of scale, then lock the knob.

6. Adjust the "NO ZERO" knob until the NO pen reads 5% of chart. Lock.

7. Turn the meter switch to "NO_x" position and adjust the "NO_x ZERO" knob until the meter reads 5% of scale. Lock.

8. Recheck the zero on the two pen chart recorder and allow 5-10 minutes to check the chart trace on zero.

9. Connect the instrument inlet to the output manifold of the calibration apparatus. Keep the ozone and NO off, so that zero air is being provided.

10. Switch the instrument to "AMBIENT" and sample the calibration zero air. There should be no change in the zero readings. If there is a change, check the following:

    a. If calibration zero air reads higher than instrument zero, check UV lamp and zero scrubber on calibration apparatus and replace scrubber material.

    b. If calibration zero air reads lower than instrument zero, check zero scrubber and UV lamp on instrument zero module and change scrubber material.

II. NO CALIBRATION

1. Turn the 3-way valve to the bubble flowmeter position and turn on the NO cylinder valve.

2. Adjust air flow and NO pressure to get approximately 0.4 ppm NO.

   (A) $$\text{NO ppm} = \frac{\text{NO flow rate (cc/min)}}{\text{NO flow (cc/min)} + \text{air flow (cc/min)}} \times \text{NO Cylinder ppm}$$

3. Measure the NO flow at least twice with the bubble flowmeter.

4. Switch the 3-way valve back to regular flow and allow the instrument to sample the concentration for at least 10 minutes.

5. Calculate the exact concentration, using (A) above. Extrapolate desired chart reading using (B) below:

   (B) Chart reading (%) = (NO concentration x 200) + 5.

6. Adjust the "NO SPAN" knob until the NO recorder reads correctly, as determined in step 5 above. Lock the knob.

7. Adjust the "NO_x SPAN" knob until the instrument meter reads the same percent of scale as determined in step 5. Lock the knob.

8. Repeat steps I-4 to I-8 to recheck the NO and NO_x zero baseline. If adjustment is necessary, repeat steps II-2 to II-8.

9. Reduce the NO concentration by changing the NO flow. Measure the NO flow with bubble flowmeter and calculate the concentration as in II-2(A). Sample and measure at least three other NO concentrations. Do not change "NO ZERO" or "NO SPAN" settings.

10. Plot the 5 or more chart readings versus the NO concentration in ppm. Draw calibration curve or obtain computer printout of net chart divisions versus the NO concentration in ppm.

III. NO_2 CALIBRATION

1. Adjust the NO concentration to about 0.45 ppm. Measure the NO flow rate and calculate the exact NO concentration, using formula (A) from II-2 above.

2. Allow the instrument to sample the concentration. Switch the meter to NO_x and observe and record the meter reading. Turn on the ozone generator and adjust the slide such that the O_3 output is sufficient to oxidize about 90% of the NO present to NO_2. If the NO_x value drops more than .015 ppm (3% chart) the analyzer converter needs to be replaced.

3. Wait 10 minutes until the NO recorder reading is stable, then calculate the NO_2 concentration as follows:

(C) NO_2 (ppm) = NO_x (ppm) - NO (ppm)

where: NO_x is the original NO concentration from III-1.
NO concentration is the reading on the NO recorder, converted to ppm by the calibration curve prepared in II-9.

4. Now calculate the desired NO_2 chart reading:

NO_2 chart reading (%) - (NO_2 concentration x 200) + 5.

5. Adjust the "NO_2 SPAN" knob until the NO_2 recorder reads correctly as determined in III-4. Lock the knob.

6. Turn off the ozone lamp on the zero air scrubber and reconnect analyzer to sampling system.

APPENDIX B

Indoor/Outdoor Air Quality Data (NO_2, NO, and CO)

2-hour and daily averages

Appendix No.	House No.	Season
B-1	1	Spring-Summer
B-2	1	Fall-Winter
B-3	2	Spring-Summer
B-4	3	Spring-Summer
B-5	3	Fall-Winter
B-6	4	Fall-Winter

Appendix B-1

NO_2, NO and CO data for House No. 1 - Spring/Summer

HOUSE 1 SPRING-SUMMER NO2 AVERAGE CONCENTRATIONS , UG/M3
VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
MAX.: 6 PER 2HR,72 PER DAY

DATE	TIME	STATION 1 1M from Stove	2 Liv Rm	3 BD RM	4 OUTSIDE
5/ 9/73	0000-0200				
5/ 9/73	0200-0400	******	******	******	******
5/ 9/73	0400-0600	******	******	******	******
5/ 9/73	0600-0800	******	******	******	******
5/ 9/73	0800-1000	******	******	******	******
5/ 9/73	1000-1200	******	******	******	******
5/ 9/73	1200-1400	******	******	******	******
5/ 9/73	1400-1600	81.5 (3)	78.9 (3)	71.3 (3)	66.2 (3)
5/ 9/73	1600-1800	454.7 (6)	150.2 (6)	129.8 (6)	67.5 (6)
5/ 9/73	1800-2000	83.4 (6)	72.5 (6)	73.2 (6)	63.0 (6)
5/ 9/73	2000-2200	89.1 (6)	56.6 (6)	63.6 (6)	61.1 (6)
5/ 9/73	2200-2400	88.5 (6)	65.5 (6)	59.8 (6)	62.4 (6)
5/10/73	0000-0200	75.1 (6)	52.2 (6)	50.9 (6)	47.7 (6)
5/10/73	0200-0400	84.6 (6)	42.0 (6)	48.4 (6)	48.4 (6)
5/10/73	0400-0600	99.9 (6)	55.4 (6)	57.9 (6)	47.7 (6)
5/10/73	0600-0800	125.4 (6)	66.8 (6)	59.8 (6)	52.5 (6)
5/10/73	0800-1000	******	******	******	******
5/10/73	1000-1200	******	******	******	******
5/10/73	1200-1400	******	******	******	******
5/10/73	1400-1600	208.7 (3)	89.1 (3)	78.9 (3)	54.7 (3)
5/10/73	1600-1800	199.2 (6)	140.6 (6)	117.1 (6)	63.6 (6)
5/10/73	1800-2000	90.4 (6)	73.8 (6)	70.0 (6)	56.6 (6)
5/10/73	2000-2200	93.5 (6)	75.1 (6)	68.1 (6)	58.5 (6)
5/10/73	2200-2400	84.6 (6)	57.9 (6)	52.8 (6)	38.2 (6)
5/11/73	0000-0200	67.2 (5)	40.1 (6)	36.9 (6)	28.0 (6)
5/11/73	0200-0400	57.3 (6)	35.6 (6)	30.5 (6)	26.7 (6)
5/11/73	0400-0600	56.6 (6)	39.5 (6)	35.6 (6)	28.0 (6)
5/11/73	0600-0800	82.1 (6)	47.7 (6)	41.4 (6)	41.4 (6)
5/11/73	0800-1000	79.5 (6)	69.4 (6)	73.2 (6)	66.2 (6)
5/11/73	1000-1200	******	******	******	******
5/11/73	1200-1400	26.7 (3)	33.1 (3)	34.4 (3)	28.0 (3)
5/11/73	1400-1600	29.3 (6)	31.2 (6)	35.0 (6)	34.4 (6)
5/11/73	1600-1800	51.2 (5)	55.0 (5)	74.8 (5)	64.1 (5)
5/11/73	1800-2000	******	******	******	******
5/11/73	2000-2200	100.5 (6)	78.3 (6)	73.2 (6)	49.6 (6)
5/11/73	2200-2400	76.4 (6)	58.5 (6)	51.5 (6)	32.5 (6)

Note: **** indicates no
valid data collected

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HOUSE  1  SPRING-SUMMER       NO2 AVERAGE CONCENTRATIONS , UG/M3
   VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
      MAX.: 6 PER 2HR,72 PER DAY

                                                 STATION
  DATE          TIME            1 A            2               3               4
                          1M from Stove     Liv Rm           BD RM          OUTSIDE

  5/12/73   0000-0200        71.9 ( 6)      49.0 ( 6)      38.2 ( 6)      31.8 ( 6)
  5/12/73   0200-0400        80.8 ( 6)      45.8 ( 6)      37.5 ( 6)      33.7 ( 6)
  5/12/73   0400-0600        70.0 ( 6)      30.5 ( 6)      31.2 ( 6)      21.6 ( 6)
  5/12/73   0600-0800       102.4 ( 6)      56.6 ( 6)      44.5 ( 6)      44.5 ( 6)
  5/12/73   0800-1000        98.0 ( 6)      52.2 ( 6)      84.6 ( 6)      45.8 ( 6)
  5/12/73   1000-1200       187.1 ( 4)      81.1 ( 4)      55.4 ( 4)      34.4 ( 4)
  5/12/73   1200-1400       302.9 ( 6)     143.2 ( 6)      66.8 ( 6)      45.2 ( 6)
  5/12/73   1400-1600       152.7 ( 6)     146.4 ( 6)     136.2 ( 6)      37.5 ( 6)
  5/12/73   1600-1800       174.4 ( 6)      91.6 ( 6)      96.7 ( 6)      33.1 ( 6)
  5/12/73   1800-2000        80.8 ( 6)      70.0 ( 6)      62.4 ( 6)      55.4 ( 6)
  5/12/73   2000-2200        87.8 ( 6)      63.4 ( 6)      50.3 ( 6)      71.3 ( 6)
  5/12/73   2200-2400        89.1 ( 6)      57.3 ( 6)      42.6 ( 6)      70.6 ( 6)

DAILY AVERAGE =             124.8           74.4           62.2           43.7
 (AVG OF 2HR VALUES)


  5/13/73   0000-0200        91.6 ( 6)      55.4 ( 6)      41.4 ( 6)      57.9 ( 6)
  5/13/73   0200-0400        83.4 ( 6)      59.2 ( 6)      37.5 ( 6)      40.7 ( 6)
  5/13/73   0400-0600        85.9 ( 6)      41.4 ( 6)      33.1 ( 6)      33.7 ( 6)
  5/13/73   0600-0800        64.9 ( 6)      36.9 ( 6)      29.3 ( 6)      28.0 ( 6)
  5/13/73   0800-1000        92.3 ( 6)      52.2 ( 6)      44.5 ( 6)      22.9 ( 6)
  5/13/73   1000-1200        41.4 ( 6)      38.8 ( 6)      43.9 ( 6)      12.7 ( 6)
  5/13/73   1200-1400        49.0 ( 6)      30.5 ( 6)      54.7 ( 6)       8.3 ( 6)
  5/13/73   1400-1600        47.7 ( 6)      22.3 ( 6)      25.5 ( 6)       9.9 ( 6)
  5/13/73   1600-1800        47.1 ( 6)      21.6 ( 6)      24.2 ( 6)      13.4 ( 6)
  5/13/73   1800-2000        54.7 ( 6)      26.7 ( 6)      25.5 ( 6)      12.1 ( 6)
  5/13/73   2000-2200        61.7 ( 6)      25.0 ( 6)      29.3 ( 6)      22.9 ( 6)
  5/13/73   2200-2400        62.4 ( 6)      42.6 ( 6)      34.4 ( 6)      40.7 ( 6)

DAILY AVERAGE =              65.2           38.0           35.3           25.3
 (AVG OF 2HR VALUES)


  5/14/73   0000-0200        69.4 ( 6)      48.4 ( 6)      32.5 ( 6)      42.6 ( 6)
  5/14/73   0200-0400        57.9 ( 6)      38.8 ( 6)      29.3 ( 6)      37.5 ( 6)
  5/14/73   0400-0600        51.5 ( 6)      36.9 ( 6)      32.5 ( 6)      30.5 ( 6)
  5/14/73   0600-0800       108.2 ( 6)      59.2 ( 6)      38.2 ( 6)      36.9 ( 6)
  5/14/73   0800-1000        60.5 ( 6)      38.8 ( 6)      42.6 ( 6)      22.9 ( 6)
  5/14/73   1000-1200        45.8 ( 6)      42.6 ( 6)      58.5 ( 6)      12.7 ( 6)
  5/14/73   1200-1400        ******         ******         ******         ******
  5/14/73   1400-1600        ******         ******         ******         ******
  5/14/73   1600-1800       207.1 ( 6)      94.8 ( 6)      84.0 ( 6)      62.4 ( 6)
  5/14/73   1800-2000       114.5 ( 6)      92.3 ( 6)      88.5 ( 6)      80.8 ( 6)
  5/14/73   2000-2200       120.9 ( 6)      96.7 ( 6)      75.1 ( 6)     117.7 ( 6)
  5/14/73   2200-2400       116.4 ( 6)      91.0 ( 6)      67.5 ( 6)     110.1 ( 6)
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HOUSE  1  SPRING-SUMMER       NO2 AVERAGE CONCENTRATIONS , UG/M3
   VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
      MAX.: 6 PER 2HR,72 PER DAY

                                                  STATION
    DATE          TIME              1              2               3                4
                              1M from Stove     Liv Rm           BD RM          OUTSIDE

    5/15/73    0000-0200       109.4 ( 6)      79.5 ( 6)      57.3 ( 6)      87.8 ( 6)
    5/15/73    0200-0400        95.4 ( 6)      66.2 ( 6)      53.5 ( 6)      70.6 ( 6)
    5/15/73    0400-0600        87.2 ( 6)      43.4 ( 6)      49.0 ( 6)      66.8 ( 6)
    5/15/73    0600-0800       138.1 ( 6)      56.0 ( 6)      45.8 ( 6)      59.2 ( 6)
    5/15/73    0800-1000        99.3 ( 6)      56.6 ( 6)      49.0 ( 6)      51.5 ( 6)
    5/15/73    1000-1200       113.9 ( 6)      60.5 ( 6)      49.6 ( 6)      63.0 ( 6)
    5/15/73    1200-1400       321.3 ( 6)     159.7 ( 6)     125.4 ( 6)      85.9 ( 6)
    5/15/73    1400-1600       318.6 ( 6)     201.1 ( 6)     168.6 ( 6)      89.1 ( 6)
    5/15/73    1600-1800       229.1 ( 4)     163.9 ( 4)     146.0 ( 4)      64.9 ( 4)
    5/15/73    1800-2000       129.2 ( 6)      78.3 ( 6)      77.0 ( 6)      70.0 ( 6)
    5/15/73    2000-2200        99.9 ( 6)      79.5 ( 6)      57.9 ( 6)      96.7 ( 6)
    5/15/73    2200-2400       107.5 ( 6)      82.7 ( 6)      64.9 ( 6)      74.5 ( 6)

DAILY AVERAGE =                154.1           94.9           78.7           73.3
 (AVG OF 2HR VALUES)


    5/16/73    0000-0200        99.9 ( 6)      59.2 ( 6)      61.1 ( 6)      31.8 ( 6)
    5/16/73    0200-0400        78.3 ( 6)      42.6 ( 6)      40.7 ( 6)      22.3 ( 6)
    5/16/73    0400-0600        74.5 ( 6)      40.1 ( 6)      37.5 ( 6)      26.1 ( 6)
    5/16/73    0600-0800       129.8 ( 6)      71.3 ( 6)      54.1 ( 6)      28.0 ( 6)
    5/16/73    0800-1000        77.0 ( 6)      62.4 ( 6)      69.4 ( 6)      31.2 ( 6)
    5/16/73    1000-1200        50.3 ( 6)      29.3 ( 6)      29.9 ( 6)      18.5 ( 6)
    5/16/73    1200-1400        45.8 ( 6)      37.5 ( 6)      34.4 ( 6)      24.2 ( 6)
    5/16/73    1400-1600        65.9 ( 4)      52.5 ( 4)      46.8 ( 4)      24.8 ( 4)
    5/16/73    1600-1800        ******         ******         ******         ******
    5/16/73    1800-2000        ******         ******         ******         ******
    5/16/73    2000-2200        ******         ******         ******         ******
    5/16/73    2200-2400        ******         ******         ******         ******



    5/21/73    0000-0200        ******         ******         ******         ******
    5/21/73    0200-0400        ******         ******         ******         ******
    5/21/73    0400-0600        ******         ******         ******         ******
    5/21/73    0600-0800        ******         ******         ******         ******
    5/21/73    0800-1000        ******         ******         ******         ******
    5/21/73    1000-1200        ******         ******         ******         ******
    5/21/73    1200-1400        45.8 ( 6)      28.6 ( 6)      26.7 ( 6)      23.5 ( 6)
    5/21/73    1400-1600        54.7 ( 6)      36.3 ( 6)      30.5 ( 6)      16.5 ( 6)
    5/21/73    1600-1800        49.0 ( 6)      36.9 ( 6)      25.5 ( 6)      19.1 ( 6)
    5/21/73    1800-2000        62.4 ( 6)      36.3 ( 6)      30.5 ( 6)      21.6 ( 6)
    5/21/73    2000-2200       134.9 ( 6)      57.9 ( 6)     104.4 ( 6)      32.5 ( 6)
    5/21/73    2200-2400        52.8 ( 6)      33.1 ( 6)      33.1 ( 6)      13.4 ( 6)
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HOUSE  1  SPRING-SUMMER        NO2 AVERAGE CONCENTRATIONS , UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                  STATION
  DATE        TIME            1               2                 3               4
                         1M from Stove   Liv Rm              BD RM         OUTSIDE

  5/22/73   0000-0200       43.3 ( 6)     26.1 ( 6)      23.5 ( 6)       6.9 ( 5)
  5/22/73   0200-0400       47.1 ( 6)     26.7 ( 6)      22.9 ( 6)       9.2 ( 5)
  5/22/73   0400-0600       50.3 ( 6)     27.4 ( 6)      19.1 ( 6)      13.4 ( 6)
  5/22/73   0600-0800      155.9 ( 6)     37.5 ( 6)      22.3 ( 6)      22.3 ( 6)
  5/22/73   0800-1000       55.4 ( 6)     46.5 ( 6)      35.0 ( 6)      14.0 ( 6)
  5/22/73   1000-1200       36.9 ( 6)     24.8 ( 6)      17.8 ( 6)       9.5 ( 6)
  5/22/73   1200-1400       39.5 ( 6)     27.4 ( 6)      19.1 ( 6)      12.1 ( 6)
  5/22/73   1400-1600       57.3 ( 3)     23.3 ( 3)      25.5 ( 3)      21.6 ( 3)
  5/22/73   1600-1800      124.1 ( 6)     64.9 ( 6)      40.7 ( 6)      21.0 ( 6)
  5/22/73   1800-2000       71.3 ( 6)     54.7 ( 6)      52.2 ( 6)      36.9 ( 6)
  5/22/73   2000-2200       77.6 ( 6)     54.1 ( 6)      47.1 ( 6)      66.2 ( 6)
  5/22/73   2200-2400       78.3 ( 6)     56.6 ( 6)      42.0 ( 6)      62.4 ( 6)

DAILY AVERAGE =             69.7          39.7           30.6           24.6
 (AVG OF 2HR VALUES)


  5/23/73   0000-0200       91.6 ( 6)     56.6 ( 6)      42.6 ( 6)      54.7 ( 6)
  5/23/73   0200-0400       91.6 ( 6)     47.7 ( 6)      37.5 ( 6)      49.0 ( 6)
  5/23/73   0400-0600       87.8 ( 6)     42.0 ( 6)      46.5 ( 6)      39.5 ( 6)
  5/23/73   0600-0800       81.5 ( 6)     56.6 ( 6)      38.8 ( 6)      46.5 ( 6)
  5/23/73   0800-1000       78.3 ( 6)     62.4 ( 6)      62.4 ( 6)      81.5 ( 6)
  5/23/73   1000-1200       71.8 ( 5)     54.2 ( 5)      55.7 ( 5)      64.0 ( 4)
  5/23/73   1200-1400       85.9 ( 6)     55.4 ( 6)      53.5 ( 6)      39.5 ( 6)
  5/23/73   1400-1600       97.4 ( 6)     63.6 ( 6)      57.3 ( 6)      55.4 ( 6)
  5/23/73   1600-1800      181.4 ( 6)    112.0 ( 6)      89.7 ( 6)      75.7 ( 6)
  5/23/73   1800-2000       88.5 ( 6)     74.5 ( 6)      66.2 ( 6)      68.7 ( 6)
  5/23/73   2000-2200      101.8 ( 6)     52.2 ( 6)      50.3 ( 6)      49.6 ( 6)
  5/23/73   2200-2400       75.1 ( 6)     46.5 ( 6)      43.3 ( 6)      54.1 ( 6)

DAILY AVERAGE =             94.4          60.3           53.6           56.5
 (AVG OF 2HR VALUES)


  5/24/73   0000-0200       70.0 ( 6)     43.9 ( 6)      42.6 ( 6)      34.4 ( 6)
  5/24/73   0200-0400       64.9 ( 6)     48.4 ( 6)      40.7 ( 6)      47.1 ( 6)
  5/24/73   0400-0600       68.1 ( 6)     45.2 ( 6)      38.8 ( 6)      43.9 ( 6)
  5/24/73   0600-0800      163.5 ( 6)     77.6 ( 6)      54.7 ( 6)      54.1 ( 6)
  5/24/73   0800-1000       93.5 ( 6)     59.8 ( 6)      49.0 ( 6)      49.0 ( 6)
  5/24/73   1000-1200       63.0 ( 6)     43.3 ( 6)      44.5 ( 6)      33.7 ( 6)
  5/24/73   1200-1400       87.2 ( 6)     79.9 ( 6)      57.9 ( 6)      34.4 ( 6)
  5/24/73   1400-1600       73.2 ( 6)     56.6 ( 6)      46.5 ( 6)      34.4 ( 6)
  5/24/73   1600-1800       78.9 ( 6)     59.8 ( 6)      54.1 ( 6)      43.3 ( 6)
  5/24/73   1800-2000       87.8 ( 6)     54.1 ( 6)      54.1 ( 6)      38.6 ( 6)
  5/24/73   2000-2200      110.7 ( 6)     54.7 ( 6)      56.6 ( 6)      45.8 ( 6)
  5/24/73   2200-2400       86.5 ( 6)     49.6 ( 6)      46.5 ( 6)      47.7 ( 6)

DAILY AVERAGE =             87.3          56.0           48.8           42.2
 (AVG OF 2HR VALUES)
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HØUSE  1  SPRING-SUMMER       NØ2 AVERAGE CØNCENTRATIØNS , UG/M3
   VALUES IN ( ) ARE NØ. ØF ØBSERVATIØNS IN PERIØD
      MAX.: 6 PER 2HR,72 PER DAY

                                                    STATIØN
    DATE          TIME            1                2                 3                4
                            1M from Stove      Liv Rm              BD RM           ØUTSIDE

   5/25/73   0000-0200       71.9 ( 6)       42.6 ( 6)       35.6 ( 6)       43.9 ( 6)
   5/25/73   0200-0400       57.9 ( 6)       40.1 ( 6)       30.5 ( 6)       27.4 ( 6)
   5/25/73   0400-0600       55.4 ( 6)       26.1 ( 6)       22.3 ( 6)       12.7 ( 6)
   5/25/73   0600-0800       52.2 ( 6)       35.6 ( 6)       28.6 ( 6)       38.2 ( 6)
   5/25/73   0800-1000       64.9 ( 6)       30.5 ( 6)       32.5 ( 6)       31.8 ( 6)
   5/25/73   1000-1200       59.8 ( 6)       40.7 ( 6)       40.1 ( 6)       36.3 ( 6)
   5/25/73   1200-1400       70.3 ( 5)       42.0 ( 5)       39.7 ( 5)       42.0 ( 5)
   5/25/73   1400-1600        ******          ******          ******          ******
   5/25/73   1600-1800        ******          ******          ******          ******
   5/25/73   1800-2000        ******          ******          ******          ******
   5/25/73   2000-2200        ******          ******          ******          ******
   5/25/73   2200-2400        ******          ******          ******          ******
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```
HOUSE  1  SPRING-SUMMER    NO     AVERAGE CONCENTRATIONS , UG/M3
   VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
      MAX.: 6 PER 2HR,72 PER DAY

                                              STATION
  DATE       TIME               1                2               3              4
                          1M from Stove       Liv Rm            BD RM        OUTSIDE

 5/ 9/73   0000-0200         ******           ******          ******         ******
 5/ 9/73   0200-0400         ******           ******          ******         ******
 5/ 9/73   0400-0600         ******           ******          ******         ******
 5/ 9/73   0600-0800         ******           ******          ******         ******
 5/ 9/73   0800-1000         ******           ******          ******         ******
 5/ 9/73   1000-1200         ******           ******          ******         ******
 5/ 9/73   1200-1400         ******           ******          ******         ******
 5/ 9/73   1400-1600      275.0 ( 3)       107.8 ( 3)       40.8 ( 3)      15.9 ( 3)
 5/ 9/73   1600-1800      542.4 ( 6)       314.8 ( 6)      267.7 ( 6)      17.6 ( 6)
 5/ 9/73   1800-2000      202.3 ( 6)       172.6 ( 6)      156.8 ( 6)      17.1 ( 6)
 5/ 9/73   2000-2200      128.3 ( 6)       116.2 ( 6)      122.3 ( 6)      10.9 ( 6)
 5/ 9/73   2200-2400       84.9 ( 6)        64.8 ( 6)       36.1 ( 6)       7.9 ( 6)



 5/10/73   0000-0200       74.0 ( 6)        44.7 ( 6)       67.3 ( 6)       7.9 ( 5)
 5/10/73   0200-0400       58.5 ( 6)        31.8 ( 6)       48.1 ( 6)       3.5 ( 5)
 5/10/73   0400-0600       53.1 ( 6)        28.4 ( 6)       41.0 ( 6)       6.7 ( 5)
 5/10/73   0600-0800      115.6 ( 6)        41.4 ( 6)       48.1 ( 6)      10.0 ( 3)
 5/10/73   0800-1000        ******           ******          ******         ******
 5/10/73   1000-1200        ******           ******          ******         ******
 5/10/73   1200-1400        ******           ******          ******         ******
 5/10/73   1400-1600      135.8 ( 3)        17.6 ( 3)       10.0 ( 3)       7.5 ( 3)
 5/10/73   1600-1800      153.8 ( 6)        33.7 ( 6)       32.2 ( 6)      14.6 ( 6)
 5/10/73   1800-2000        7.9 ( 6)         3.5 ( 5)        5.4 ( 6)       5.0 ( 4)
 5/10/73   2000-2200        5.0 ( 5)         4.2 ( 3)        2.5 ( 3)       3.8 ( 2)
 5/10/73   2200-2400        7.1 ( 6)         4.0 ( 5)        4.2 ( 6)       4.2 ( 6)



   BAD TIME ON CARD
 5/11/73   0000-0200       41.6 ( 5)        17.6 ( 6)       13.8 ( 6)       8.4 ( 6)
 5/11/73   0200-0400       57.7 ( 6)        37.2 ( 6)       26.3 ( 6)      12.1 ( 6)
 5/11/73   0400-0600       57.7 ( 6)        35.5 ( 6)       21.3 ( 6)      11.7 ( 6)
 5/11/73   0600-0800       63.5 ( 6)        33.0 ( 6)       22.6 ( 6)      15.0 ( 6)
 5/11/73   0800-1000       49.7 ( 6)        16.7 ( 6)       21.3 ( 6)       9.6 ( 6)
 5/11/73   1000-1200        ******           ******          ******         ******
 5/11/73   1200-1400       11.3 ( 2)         6.3 ( 2)        5.0 ( 2)       4.2 ( 3)
 5/11/73   1400-1600        3.8 ( 4)         2.5 ( 4)        4.5 ( 5)       3.5 ( 5)
 5/11/73   1600-1800       14.0 ( 5)        15.0 ( 5)       35.1 ( 5)      22.6 ( 5)
 5/11/73   1800-2000        ******           ******          ******         ******
 5/11/73   2000-2200      118.1 ( 6)        64.0 ( 6)       86.1 ( 6)       4.5 ( 5)
 5/11/73   2200-2400       15.0 ( 6)         7.1 ( 6)       10.0 ( 6)       3.8 ( 6)
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HOUSE  1  SPRING-SUMMER   NO     AVERAGE CONCENTRATIONS , UG/M3
   VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
      MAX.: 6 PER 2HR,72 PER DAY

                                                       STATION
   DATE          TIME           1 A              2                3               4
                           1M from Stove     Liv. Rm            BD RM          OUTSIDE

  5/12/73   0000-0200        14.2 ( 6)       3.8 ( 2)       5.0 ( 2)       2.5 ( 1)
  5/12/73   0200-0400        21.3 ( 6)       3.3 ( 3)       4.5 ( 5)       4.5 ( 5)
  5/12/73   0400-0600        18.8 ( 6)       6.7 ( 3)       6.7 ( 3)      13.4 ( 3)
  5/12/73   0600-0800        92.0 ( 6)      35.9 ( 6)      27.6 ( 6)      29.1 ( 5)
  5/12/73   0800-1000       130.0 ( 6)      80.3 ( 6)     130.2 ( 6)      19.6 ( 6)
  5/12/73   1000-1200       197.2 ( 4)     105.3 ( 4)      43.3 ( 4)       8.8 ( 4)
  5/12/73   1200-1400       313.1 ( 6)     169.3 ( 6)      44.3 ( 6)      13.4 ( 6)
  5/12/73   1400-1600       177.6 ( 6)     102.8 ( 6)     103.2 ( 6)      16.3 ( 6)
  5/12/73   1600-1800       147.6 ( 6)     110.4 ( 6)     120.0 ( 6)      26.3 ( 6)
  5/12/73   1800-2000        87.4 ( 6)      71.5 ( 6)      89.9 ( 6)      24.6 ( 5)
  5/12/73   2000-2200        48.9 ( 6)      30.9 ( 6)      42.2 ( 6)      30.1 ( 5)
  5/12/73   2200-2400        89.3 ( 6)      60.6 ( 6)      67.7 ( 6)      32.2 ( 6)

DAILY AVERAGE =             111.5           65.1           57.1           18.4
 (AVG OF 2HR VALUES)


  5/13/73   0000-0200        84.4 ( 6)      51.8 ( 6)      65.2 ( 6)      42.6 ( 6)
  5/13/73   0200-0400        64.4 ( 6)      26.3 ( 6)      49.3 ( 6)       5.0 ( 6)
  5/13/73   0400-0600        46.4 ( 6)      15.9 ( 6)      30.9 ( 6)       3.3 ( 6)
  5/13/73   0600-0800        41.8 ( 6)      12.5 ( 6)      19.6 ( 6)       4.6 ( 6)
  5/13/73   0800-1000       125.4 ( 6)      61.9 ( 6)      61.4 ( 6)       7.5 ( 6)
  5/13/73   1000-1200        31.8 ( 6)      26.8 ( 6)      32.6 ( 6)      14.2 ( 6)
  5/13/73   1200-1400        28.4 ( 6)      13.8 ( 6)      13.4 ( 6)      13.0 ( 6)
  5/13/73   1400-1600        23.8 ( 6)      10.9 ( 6)      13.0 ( 6)      12.1 ( 6)
  5/13/73   1600-1800        26.8 ( 6)      13.8 ( 6)      14.6 ( 6)      13.0 ( 6)
  5/13/73   1800-2000        25.1 ( 6)       7.1 ( 6)       8.4 ( 6)       7.9 ( 6)
  5/13/73   2000-2200        27.2 ( 6)       5.0 ( 6)       6.3 ( 4)       5.0 ( 6)
  5/13/73   2200-2400        41.0 ( 6)      16.7 ( 6)      18.4 ( 6)      10.9 ( 6)

DAILY AVERAGE =              47.2           21.9           27.8           11.6
 (AVG OF 2HR VALUES)


  5/14/73   0000-0200        63.5 ( 6)      41.4 ( 6)      42.2 ( 6)      49.3 ( 6)
  5/14/73   0200-0400       122.9 ( 6)     105.8 ( 6)     100.3 ( 6)     105.8 ( 6)
  5/14/73   0400-0600        99.1 ( 6)      86.5 ( 6)     101.6 ( 6)      62.3 ( 6)
  5/14/73   0600-0800       236.1 ( 6)     219.7 ( 6)     191.0 ( 6)     169.7 ( 6)
  5/14/73   0800-1000       186.4 ( 6)     150.9 ( 6)     188.9 ( 6)      38.5 ( 6)
  5/14/73   1000-1200        45.6 ( 6)      35.1 ( 6)      29.3 ( 6)      13.0 ( 6)
  5/14/73   1200-1400         ******          ******         ******         ******
  5/14/73   1400-1600         ******          ******         ******         ******
  5/14/73   1600-1800       202.7 ( 6)      75.7 ( 6)     105.3 ( 5)       4.5 ( 5)
  5/14/73   1800-2000        21.7 ( 6)      15.7 ( 4)      28.2 ( 4)       4.2 ( 3)
  5/14/73   2000-2200        35.1 ( 6)      14.5 ( 5)       9.0 ( 5)      27.0 ( 4)
  5/14/73   2200-2400        78.6 ( 6)      49.7 ( 6)      44.7 ( 6)      30.9 ( 6)
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HOUSE  1  SPRING-SUMMER    NO     AVERAGE CONCENTRATIONS , UG/M3
   VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
      MAX.: 6 PER 2HR,72 PER DAY

                                                     STATION
   DATE          TIME             1 A              2
                           1M from Stove      Liv Rm              3                4
                                                                BD RM           OUTSIDE

  5/15/73    0000-0200        60.6 ( 6)      27.6 ( 6)      35.9 ( 6)       7.9 ( 5)
  5/15/73    0200-0400        58.1 ( 6)      31.3 ( 6)      35.9 ( 6)      28.6 ( 5)
  5/15/73    0400-0600        65.6 ( 6)      33.7 ( 6)      43.5 ( 6)      27.2 ( 6)
  5/15/73    0600-0800       152.8 ( 6)      76.9 ( 6)      75.7 ( 6)      66.0 ( 6)
  5/15/73    0800-1000       155.5 ( 6)     129.2 ( 6)     137.5 ( 6)      49.7 ( 5)
  5/15/73    1000-1200       165.3 ( 6)     133.3 ( 6)     132.1 ( 6)     105.6 ( 6)
  5/15/73    1200-1400       294.5 ( 6)     296.6 ( 6)     294.1 ( 6)      76.1 ( 6)
  5/15/73    1400-1600       360.7 ( 6)     410.1 ( 6)     425.5 ( 6)      39.3 ( 6)
  5/15/73    1600-1800       294.7 ( 4)     259.6 ( 4)     279.0 ( 4)      11.3 ( 4)
  5/15/73    1800-2000       166.6 ( 6)     116.6 ( 5)     163.0 ( 6)       3.5 ( 5)
  5/15/73    2000-2200        62.3 ( 6)      39.0 ( 6)      69.8 ( 6)      15.5 ( 5)
  5/15/73    2200-2400        57.7 ( 6)      29.8 ( 6)      42.2 ( 6)      15.0 ( 3)
 DAILY AVERAGE =
  (AVG OF 2HR VALUES)        174.5          132.3          144.5           37.2


  5/16/73    0000-0200        29.3 ( 6)       6.5 ( 5)      16.3 ( 6)       4.5 ( 5)
  5/16/73    0200-0400        14.2 ( 6)       3.1 ( 4)       2.5 ( 4)       2.5 ( 5)
  5/16/73    0400-0600        15.9 ( 6)       5.0 ( 5)       2.5 ( 1)       3.1 ( 4)
  5/16/73    0600-0800       134.4 ( 6)      61.9 ( 6)      46.4 ( 6)       3.8 ( 6)
  5/16/73    0800-1000        43.9 ( 6)      23.4 ( 6)       7.9 ( 6)       5.9 ( 6)
  5/16/73    1000-1200        18.4 ( 6)       7.1 ( 6)       5.4 ( 6)       5.9 ( 6)
  5/16/73    1200-1400         8.5 ( 5)       5.4 ( 6)       3.8 ( 6)       6.0 ( 5)
  5/16/73    1400-1600        25.7 ( 4)      10.7 ( 4)       9.4 ( 4)       6.3 ( 4)
  5/16/73    1600-1800         ******         ******         ******          ******
  5/16/73    1800-2000         ******         ******         ******          ******
  5/16/73    2000-2200         ******         ******         ******          ******
  5/16/73    2200-2400         ******         ******         ******          ******



  5/21/73    0000-0200         ******         ******         ******          ******
  5/21/73    0200-0400         ******         ******         ******          ******
  5/21/73    0400-0600         ******         ******         ******          ******
  5/21/73    0600-0800         ******         ******         ******          ******
  5/21/73    0800-1000         ******         ******         ******          ******
  5/21/73    1000-1200         ******         ******         ******          ******
  5/21/73    1200-1400        27.6 ( 6)      18.8 ( 6)      18.0 ( 6)      17.6 ( 6)
  5/21/73    1400-1600        24.7 ( 6)      10.9 ( 6)       7.5 ( 6)       9.6 ( 6)
  5/21/73    1600-1800        20.9 ( 6)       7.9 ( 6)       5.0 ( 6)       7.1 ( 6)
  5/21/73    1800-2000        33.4 ( 6)      10.9 ( 6)       7.5 ( 6)       7.5 ( 6)
  5/21/73    2000-2200       261.9 ( 6)     155.1 ( 6)     211.3 ( 6)      51.8 ( 6)
  5/21/73    2200-2400        84.9 ( 6)      63.1 ( 6)      58.9 ( 6)       8.8 ( 6)
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HOUSE  1  SPRING-SUMMER   NO     AVERAGE CONCENTRATIONS , UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                               STATION
  DATE        TIME              1 A              2                3              4
                          1M from Stove      Liv Rm            BD RM         OUTSIDE

 5/22/73   0000-0200         41.0 ( 6)       21.7 ( 6)       14.6 ( 6)        4.5 ( 5)
 5/22/73   0200-0400         33.4 ( 6)       13.8 ( 6)        7.5 ( 6)        5.4 ( 6)
 5/22/73   0400-0600         36.4 ( 6)       17.1 ( 6)       12.1 ( 6)        8.6 ( 6)
 5/22/73   0600-0800        248.3 ( 6)       54.3 ( 6)       22.6 ( 6)       14.6 ( 6)
 5/22/73   0800-1000         99.5 ( 6)       63.4 ( 6)       51.4 ( 6)       12.1 ( 6)
 5/22/73   1000-1200         33.9 ( 6)        7.9 ( 6)        6.3 ( 6)        4.6 ( 6)
 5/22/73   1200-1400         19.2 ( 6)       11.7 ( 6)        9.6 ( 6)        8.4 ( 6)
 5/22/73   1400-1600         16.7 ( 3)        7.5 ( 3)        3.3 ( 3)        3.3 ( 3)
 5/22/73   1600-1800         99.9 ( 6)       35.5 ( 6)       17.6 ( 5)        5.0 ( 6)
 5/22/73   1800-2000         31.3 ( 6)       15.9 ( 6)       13.4 ( 6)       10.0 ( 6)
 5/22/73   2000-2200         42.6 ( 6)       22.2 ( 6)       17.6 ( 6)       21.3 ( 6)
 5/22/73   2200-2400         91.5 ( 6)       77.3 ( 6)       59.8 ( 6)       93.2 ( 6)

DAILY AVERAGE =              66.1            29.5            19.6            15.9
 (AVG OF 2HR VALUES)


 5/23/73   0000-0200        164.7 ( 6)      127.9 ( 6)      125.4 ( 6)      153.0 ( 5)
 5/23/73   0200-0400        190.6 ( 6)      153.4 ( 6)      158.0 ( 6)      143.4 ( 6)
 5/23/73   0400-0600        189.8 ( 6)      152.6 ( 6)      164.3 ( 6)      163.9 ( 6)
 5/23/73   0600-0800        226.1 ( 6)      178.1 ( 6)      178.5 ( 6)      136.3 ( 6)
 5/23/73   0800-1000        142.1 ( 6)      123.7 ( 6)      142.1 ( 6)       39.0 ( 6)
 5/23/73   1000-1200        126.4 ( 5)      117.9 ( 5)       98.8 ( 5)       28.8 ( 4)
 5/23/73   1200-1400         46.4 ( 6)       32.2 ( 6)       21.7 ( 6)       10.4 ( 6)
 5/23/73   1400-1600         52.2 ( 6)       16.3 ( 6)       16.3 ( 6)       16.7 ( 6)
 5/23/73   1600-1800        311.2 ( 6)      135.0 ( 6)      142.1 ( 6)       21.7 ( 6)
 5/23/73   1800-2000        106.2 ( 6)       94.5 ( 6)      110.3 ( 6)       13.0 ( 6)
 5/23/73   2000-2200         91.5 ( 6)       46.8 ( 6)       68.6 ( 6)        4.0 ( 5)
 5/23/73   2200-2400         60.2 ( 6)       35.9 ( 6)       47.7 ( 6)        7.5 ( 5)

DAILY AVERAGE =             142.3           101.2           106.2            65.6
 (AVG OF 2HR VALUES)


 5/24/73   0000-0200         44.3 ( 6)       20.9 ( 6)       30.9 ( 6)        2.5 ( 5)
 5/24/73   0200-0400         42.6 ( 6)       22.2 ( 6)       26.3 ( 6)        4.6 ( 6)
 5/24/73   0400-0600         44.3 ( 6)       20.9 ( 6)       25.1 ( 6)        8.4 ( 6)
 5/24/73   0600-0800        255.0 ( 6)      100.7 ( 6)       91.5 ( 6)        9.2 ( 6)
 5/24/73   0800-1000        142.1 ( 6)       81.1 ( 6)       72.7 ( 6)       20.9 ( 6)
 5/24/73   1000-1200         50.6 ( 6)       29.3 ( 6)       23.8 ( 6)       11.7 ( 6)
 5/24/73   1200-1400        103.0 ( 6)       43.9 ( 6)       17.1 ( 6)       13.8 ( 6)
 5/24/73   1400-1600         18.8 ( 6)       13.0 ( 6)        8.4 ( 6)        9.6 ( 6)
 5/24/73   1600-1800         20.9 ( 6)       11.7 ( 6)       10.4 ( 6)        8.8 ( 6)
 5/24/73   1800-2000         24.2 ( 6)       11.7 ( 6)        8.4 ( 6)        4.6 ( 6)
 5/24/73   2000-2200         58.9 ( 6)       16.7 ( 6)       19.2 ( 6)        4.2 ( 6)
 5/24/73   2200-2400         56.8 ( 6)       29.7 ( 6)       40.1 ( 6)        4.2 ( 6)

DAILY AVERAGE =              71.8            33.5            31.2             8.5
 (AVG OF 2HR VALUES)
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HOUSE  1  SPRING-SUMMER   NO     AVERAGE CONCENTRATIONS , UG/M3
   VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
      MAX.: 6 PER 2HR,72 PER DAY

 DATE        TIME                           STATION
                            1 A              2              3              4
                      1M from Stove       Liv Rm          BD RM         OUTSIDE
5/25/73   0000-0200      51.4 ( 6)      27.2 ( 6)      40.5 ( 6)      16.3 ( 6)
5/25/73   0200-0400      48.5 ( 6)      27.6 ( 6)      33.9 ( 6)       4.0 ( 6)
5/25/73   0400-0600      40.1 ( 6)      17.1 ( 6)      25.1 ( 6)       3.5 ( 6)
5/25/73   0600-0800      43.5 ( 6)      24.2 ( 6)      26.3 ( 6)      13.4 ( 6)
5/25/73   0800-1000      60.2 ( 6)      30.5 ( 6)      25.1 ( 6)       9.6 ( 6)
5/25/73   1000-1200      33.0 ( 6)      15.0 ( 6)      12.5 ( 6)      11.3 ( 6)
5/25/73   1200-1400      42.1 ( 5)      17.1 ( 5)      13.5 ( 5)      11.0 ( 5)
5/25/73   1400-1600      ******         ******         ******         ******
5/25/73   1600-1800      ******         ******         ******         ******
5/25/73   1800-2000      ******         ******         ******         ******
5/25/73   2000-2200      ******         ******         ******         ******
5/25/73   2200-2400      ******         ******         ******         ******
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HOUSE  1   SPRING-SUMMER  CO AVERAGE CONCENTRATIONS ,UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                          STATION
  DATE          TIME               1                 2                  3               4
                             1M from Stove     Liv Rm               BD RM          OUTSIDE

 5/ 9/73   0000-0200          ******           ******            ******           ******
 5/ 9/73   0200-0400          ******           ******            ******           ******
 5/ 9/73   0400-0600          ******           ******            ******           ******
 5/ 9/73   0600-0800          ******           ******            ******           ******
 5/ 9/73   0800-1000          ******           ******            ******           ******
 5/ 9/73   1000-1200       1672. ( 4)   1617. ( 4)   1450. ( 4)   1115. ( 4)
 5/ 9/73   1200-1400       1375. ( 6)   1375. ( 6)   1189. ( 6)   1204. ( 5)
 5/ 9/73   1400-1600       1189. ( 6)    832. ( 6)    706. ( 6)    713. ( 5)
 5/ 9/73   1600-1800       3903. ( 6)   2639. ( 6)   2342. ( 6)    713. ( 5)
 5/ 9/73   1800-2000       3160. ( 6)   2676. ( 6)   2602. ( 6)    929. ( 6)
 5/ 9/73   2000-2200       3457. ( 6)   3234. ( 6)   3420. ( 6)   1635. ( 6)
 5/ 9/73   2200-2400       2528. ( 6)   2230. ( 6)   2825. ( 6)   1040. ( 6)



 5/10/73   0000-0200       2453. ( 2)   2007. ( 2)   2565. ( 2)   1449. ( 2)
 5/10/73   0200-0400         ******           ******            ******           ******
 5/10/73   0400-0600         ******           ******            ******           ******
 5/10/73   0600-0800         ******           ******            ******           ******
 5/10/73   0800-1000         ******           ******            ******           ******
 5/10/73   1000-1200         ******           ******            ******           ******
 5/10/73   1200-1400         ******           ******            ******           ******
 5/10/73   1400-1600       6036. ( 3)   3319. ( 3)   3018. ( 3)   2640. ( 3)
 5/10/73   1600-1800       4350. ( 6)   3432. ( 6)   3671. ( 6)   3067. ( 6)
 5/10/73   1800-2000       3413. ( 6)   3488. ( 6)   3601. ( 6)   3601. ( 6)
 5/10/73   2000-2200       4928. ( 6)   4551. ( 6)   4513. ( 6)   4136. ( 6)
 5/10/73   2200-2400       3394. ( 6)   3054. ( 6)   3318. ( 6)   2827. ( 6)



 5/11/73   0000-0200       4321. ( 6)   4019. ( 6)   3831. ( 6)   3265. ( 6)
 5/11/73   0200-0400       4179. ( 6)   3870. ( 6)   3802. ( 6)   3199. ( 6)
 5/11/73   0400-0600       5039. ( 6)   4889. ( 6)   4474. ( 6)   3945. ( 6)
 5/11/73   0600-0800       4979. ( 6)   4602. ( 6)   4262. ( 6)   3923. ( 6)
 5/11/73   0800-1000       5145. ( 6)   4013. ( 6)   4285. ( 6)   4014. ( 6)
 5/11/73   1000-1200         ******           ******           ******           ******
 5/11/73   1200-1400       3031. ( 6)   2292. ( 6)   2292. ( 6)   1787. ( 6)
 5/11/73   1400-1600       2157. ( 6)   1962. ( 6)   1962. ( 6)   1690. ( 6)
 5/11/73   1600-1800       3964. ( 6)   1791. ( 6)   1710. ( 6)    932. ( 6)
 5/11/73   1800-2000        971. ( 6)    582. ( 6)    582. ( 6)    232. ( 4)
 5/11/73   2000-2200       1574. ( 6)   1068. ( 6)   1185. ( 6)    581. ( 4)
 5/11/73   2200-2400       2565. ( 6)   2099. ( 6)   2565. ( 6)   1340. ( 6)
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HOUSE  1   SPRING-SUMMER  CO AVERAGE CONCENTRATIONS ,UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                 STATION
 DATE        TIME          1 A             2                 3              4
                      1M from Stove     Liv Rm            BD RM         OUTSIDE

5/12/73   0000-0200     4547. ( 6)   4158. ( 6)   4742. ( 6)   3536. ( 6)
5/12/73   0200-0400     3994. ( 6)   3567. ( 6)   4111. ( 6)   3333. ( 6)
5/12/73   0400-0600     2897. ( 6)   2431. ( 6)   3130. ( 6)   2314. ( 6)
5/12/73   0600-0800     2920. ( 6)   2414. ( 6)   2686. ( 6)   2103. ( 6)
5/12/73   0800-1000     3105. ( 6)   1823. ( 6)   1605. ( 6)   1002. ( 6)
5/12/73   1000-1200     5767. ( 6)   5373. ( 6)   5389. ( 6)   5117. ( 6)
5/12/73   1200-1400     9950. ( 6)   9055. ( 6)   7890. ( 6)   7346. ( 6)
5/12/73   1400-1600     8725. ( 6)   8131. ( 6)   8026. ( 6)   6821. ( 6)
5/12/73   1600-1800     8395. ( 6)   7812. ( 6)   7773. ( 6)   6179. ( 6)
5/12/73   1800-2000     6396. ( 6)   6685. ( 6)   6996. ( 6)   6219. ( 6)
5/12/73   2000-2200     9153. ( 6)   8725. ( 6)   9231. ( 6)   8492. ( 6)
5/12/73   2200-2400     9678. ( 6)   8901. ( 6)   9406. ( 6)   8473. ( 6)

DAILY AVERAGE =         6427.        5802.        5915.        5078.
 (AVG OF 2HR VALUES)


5/13/73   0000-0200    10416. ( 6)   9911. ( 6) 10455. ( 6)   9367. ( 6)
5/13/73   0200-0400     9650. ( 6)   9183. ( 6)   9961. ( 6)   8755. ( 6)
5/13/73   0400-0600     9389. ( 6)   8805. ( 6)   9466. ( 6)   8494. ( 6)
5/13/73   0600-0800     9838. ( 6)   9234. ( 6) 10033. ( 6)   8983. ( 6)
5/13/73   0800-1000     8303. ( 6)   9382. ( 6)   9421. ( 6)   7944. ( 6)
5/13/73   1000-1200     9859. ( 6)   9820. ( 6)   9976. ( 6)   9043. ( 6)
5/13/73   1200-1400     7618. ( 6)   7074. ( 6)   7074. ( 6)   6452. ( 6)
5/13/73   1400-1600     6844. ( 6)   6534. ( 6)   6689. ( 6)   6417. ( 6)
5/13/73   1600-1800     8014. ( 6)   7819. ( 6)   7813. ( 6)   7742. ( 6)
5/13/73   1800-2000     9421. ( 6)   9071. ( 6)   9071. ( 6)   9032. ( 6)
5/13/73   2000-2200     9270. ( 6)   8570. ( 6)   8842. ( 6)   8337. ( 6)
5/13/73   2200-2400     9118. ( 6)   8651. ( 6)   8962. ( 6)   8224. ( 6)

DAILY AVERAGE =         8978.        8676.        8981.        8233.
 (AVG OF 2HR VALUES)


5/14/73   0000-0200     7454. ( 6)   7027. ( 6)   7454. ( 6)   6910. ( 6)
5/14/73   0200-0400     7964. ( 6)   7730. ( 6)   8275. ( 6)   7575. ( 6)
5/14/73   0400-0600     8901. ( 6)   8784. ( 6)   9173. ( 6)   8667. ( 6)
5/14/73   0600-0800     6477. ( 6)   7674. ( 6)   7712. ( 6)   8792. ( 6)
5/14/73   0800-1000     8290. ( 6)   7979. ( 6)   8251. ( 6)   6774. ( 6)
5/14/73   1000-1200     7750. ( 6)   7206. ( 6)   7089. ( 6)   6467. ( 6)
5/14/73   1200-1400     5504. ( 6)   5628. ( 6)   5400. ( 6)   4307. ( 6)
5/14/73   1400-1600     2829. ( 6)   2338. ( 6)   2187. ( 6)   1735. ( 6)
5/14/73   1600-1800     2825. ( 6)   1958. ( 6)   2108. ( 6)   1391. ( 6)
5/14/73   1800-2000     2476. ( 6)   2325. ( 6)   2551. ( 6)   2438. ( 6)
5/14/73   2000-2200     3695. ( 6)   3431. ( 6)   3544. ( 6)   3280. ( 6)
5/14/73   2200-2400     3653. ( 6)   3125. ( 6)   3616. ( 6)   2484. ( 6)

DAILY AVERAGE =         5652.        5434.        5613.        5068.
 (AVG OF 24R VALUES)
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HOUSE  1   SPRING-SUMMER  CO AVERAGE CONCENTRATIONS ,UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                        STATION
   DATE         TIME              1 A                2                    3              4
                             1M from Stove       Liv Rm                BD RM         OUTSIDE

  5/15/73   0000-0200       5065. ( 6)     4612. ( 6)     5102. ( 6)     4121. ( 6)
  5/15/73   0200-0400       5528. ( 6)     5189. ( 6)     5528. ( 6)     4811. ( 6)
  5/15/73   0400-0600       5822. ( 6)     5483. ( 6)     5822. ( 6)     5219. ( 6)
  5/15/73   0600-0800       6889. ( 6)     6248. ( 6)     6324. ( 6)     5909. ( 6)
  5/15/73   0800-1000       8023. ( 6)     7646. ( 6)     7608. ( 6)     6778. ( 6)
  5/15/73   1000-1200       7600. ( 6)     7223. ( 6)     7336. ( 6)     6016. ( 6)
  5/15/73   1200-1400       5168. ( 6)     4262. ( 6)     4225. ( 6)     2225. ( 6)
  5/15/73   1400-1600       6073. ( 6)     5168. ( 6)     5357. ( 6)     1886. ( 6)
  5/15/73   1600-1800       3996. ( 6)     3475. ( 6)     3587. ( 6)      928. ( 6)
  5/15/73   1800-2000       2118. ( 6)     2007. ( 6)     2602. ( 6)     1070. ( 6)
  5/15/73   2000-2200       5847. ( 6)     5319. ( 6)     5847. ( 6)     5168. ( 6)
  5/15/73   2200-2400       5730. ( 6)     5127. ( 6)     5843. ( 6)     4560. ( 6)

 DAILY AVERAGE =            5655.          5147.          5432.          4058.
  (AVG OF 2HR VALUES)


  5/16/73   0000-0200       4106. ( 6)     3577. ( 6)     4256. ( 6)     2974. ( 6)
  5/16/73   0200-0400       3461. ( 6)     3008. ( 6)     3612. ( 6)     2744. ( 6)
  5/16/73   0400-0600       2703. ( 6)     2137. ( 6)     2627. ( 6)     1986. ( 6)
  5/16/73   0600-0800       2399. ( 6)     1682. ( 6)     2015. ( 6)     1083. ( 6)
  5/16/73   0800-1000       4358. ( 6)     3716. ( 6)     3225. ( 6)     3188. ( 6)
  5/16/73   1000-1200       5070. ( 6)     4731. ( 6)     4580. ( 6)     4316. ( 6)
  5/16/73   1200-1400       2820. ( 6)     2631. ( 6)     2593. ( 6)     2405. ( 6)
  5/16/73   1400-1600       2198. ( 6)     1858. ( 6)     1670. ( 6)     1443. ( 6)
  5/16/73   1600-1800       4099. ( 6)     2854. ( 6)     2666. ( 6)     2327. ( 6)
  5/16/73   1800-2000       3375. ( 6)     2254. ( 6)     2236. ( 6)     1219. ( 6)
  5/16/73   2000-2200       2557. ( 6)     2360. ( 6)     2557. ( 6)     1807. ( 6)
  5/16/73   2200-2400       2261. ( 6)     1857. ( 6)     2024. ( 6)     1354. ( 6)

 DAILY AVERAGE =            3284.          2723.          2838.          2237.
  (AVG OF 2HR VALUES)
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HOUSE  1   SPRING-SUMMER  CO AVERAGE CONCENTRATIONS ,UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD)
     MAX.: 6 PER 2HR,72 PER DAY

                                                  STATION
 DATE          TIME             1 A               2                  3                4
                            1M from Stove     Liv Rm               BD RM           OUTSIDE

 5/21/73   0000-0200       4407. ( 6)    4135. ( 6)    4252. ( 6)    3591. ( 6)
 5/21/73   0200-0400       5007. ( 6)    4579. ( 6)    4618. ( 6)    3841. ( 6)
 5/21/73   0400-0600       4538. ( 6)    4138. ( 6)    4032. ( 6)    3449. ( 6)
 5/21/73   0600-0800       4009. ( 6)    3076. ( 6)    2882. ( 6)    2338. ( 6)
 5/21/73   0800-1000       3210. ( 6)    2705. ( 6)    2977. ( 6)    2510. ( 6)
 5/21/73   1000-1200       3793. ( 6)    3326. ( 6)    3294. ( 6)    3060. ( 6)
 5/21/73   1200-1400       1185. ( 6)     913. ( 6)     757. ( 6)     641. ( 6)
 5/21/73   1400-1600       1002. ( 6)     614. ( 6)     497. ( 6)     341. ( 6)
 5/21/73   1600-1800       1290. ( 6)    1018. ( 6)     979. ( 6)     746. ( 6)
 5/21/73   1800-2000       2514. ( 6)    2125. ( 6)    2086. ( 6)    1931. ( 6)
 5/21/73   2000-2200       4444. ( 6)    3414. ( 6)    3272. ( 6)    2079. ( 6)
 5/21/73   2200-2400       1460. ( 6)    1421. ( 6)    1573. ( 6)     710. ( 4)

DAILY AVERAGE =            3072.         2626.         2602.         2103.
 (AVG OF 2HR VALUES)


 5/22/73   0000-0200       2407. ( 6)    2249. ( 6)    2328. ( 6)    1658. ( 6)
 5/22/73   0200-0400       1737. ( 6)    1421. ( 6)    1539. ( 6)     947. ( 6)
 5/22/73   0400-0600       1026. ( 6)    1231. ( 5)    1105. ( 6)    1066. ( 6)
 5/22/73   0600-0800       1066. ( 6)     750. ( 6)    1026. ( 6)    1381. ( 6)
 5/22/73   0800-1000        829. ( 6)     521. ( 5)     474. ( 5)     829. ( 6)
 5/22/73   1000-1200       1223. ( 6)     908. ( 6)     789. ( 6)     671. ( 6)
 5/22/73   1200-1400       1302. ( 6)    1184. ( 6)    1065. ( 6)     987. ( 6)
 5/22/73   1400-1600       1697. ( 6)    1658. ( 5)     947. ( 6)     967. ( 6)
 5/22/73   1600-1800       1539. ( 6)     726. ( 6)     276. ( 6)     316. ( 6)
 5/22/73   1800-2000       1105. ( 3)     434. ( 6)     434. ( 6)     434. ( 6)
 5/22/73   2000-2200        710. ( 5)     379. ( 5)     323. ( 6)     521. ( 5)
 5/22/73   2200-2400       2210. ( 6)    2013. ( 6)    1894. ( 6)    1815. ( 6)

DAILY AVERAGE =            1404.         1123.         1017.          968.
 (AVG OF 2HR VALUES)


 5/23/73   0000-0200       6038. ( 6)    5209. ( 6)    5328. ( 6)    4105. ( 6)
 5/23/73   0200-0400       5604. ( 6)    5091. ( 6)    5367. ( 6)    4420. ( 6)
 5/23/73   0400-0600       4617. ( 6)    4183. ( 6)    4499. ( 6)    3631. ( 6)
 5/23/73   0600-0800       3749. ( 6)    3039. ( 6)    3033. ( 6)    2170. ( 6)
 5/23/73   0800-1000       2210. ( 6)    1855. ( 6)    1894. ( 6)    1933. ( 6)
 5/23/73   1000-1200       3775. ( 4)    3593. ( 4)    3121. ( 4)    1778. ( 4)
 5/23/73   1200-1400       2259. ( 6)    1944. ( 6)    1673. ( 6)    1049. ( 6)
 5/23/73   1400-1600       1649. ( 6)    1358. ( 6)    1431. ( 6)     898. ( 6)
 5/23/73   1600-1800       3136. ( 6)    2119. ( 6)    2192. ( 6)     837. ( 6)
 5/23/73   1800-2000       2195. ( 6)    2073. ( 6)    2347. ( 6)    1434. ( 6)
 5/23/73   2000-2200       1712. ( 6)    1243. ( 6)    1663. ( 6)     345. ( 6)
 5/23/73   2200-2400       1381. ( 6)    1258. ( 6)    1554. ( 6)     528. ( 6)

DAILY AVERAGE =            3194.         2747.         2843.         1927.
 (AVG OF 2HR VALUES)
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HOUSE  1   SPRING-SUMMER  CO AVERAGE CONCENTRATIONS ,UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                     STATION
  DATE        TIME           1A              2                3             4
                         1M from Stove     Liv Rm                BD RM     OUTSIDE

  5/24/73   0000-0200     2201. ( 6)   2008. ( 6)   2226. ( 6)   1718. ( 6)
  5/24/73   0200-0400     3315. ( 6)   2936. ( 6)   3242. ( 6)   2347. ( 6)
  5/24/73   0400-0600     3412. ( 6)   3049. ( 6)   3266. ( 6)   2540. ( 6)
  5/24/73   0600-0800     4646. ( 6)   3920. ( 6)   3872. ( 6)   2928. ( 6)
  5/24/73   0800-1000     4985. ( 6)   4307. ( 6)   4085. ( 6)   3049. ( 6)
  5/24/73   1000-1200     3484. ( 6)   2952. ( 6)   2758. ( 6)   1960. ( 6)
  5/24/73   1200-1400     1727. ( 6)   1529. ( 6)   1036. ( 6)    641. ( 6)
  5/24/73   1400-1600     1350. ( 6)   1776. ( 6)   1505. ( 6)   1361. ( 6)
  5/24/73   1600-1800     1455. ( 6)   1184. ( 6)   1011. ( 6)    888. ( 6)
  5/24/73   1800-2000     1751. ( 6)   1406. ( 6)   1357. ( 6)    888. ( 6)
  5/24/73   2000-2200     2639. ( 6)   1628. ( 6)   1677. ( 6)    863. ( 6)
  5/24/73   2200-2400     1825. ( 6)   1529. ( 6)   1973. ( 6)    666. ( 6)

DAILY AVERAGE =           2774.        2356.        2334.        1656.
 (AVG OF 2HR VALUES)


  5/25/73   0000-0200     2602. ( 6)   2306. ( 6)   2972. ( 6)   2479. ( 6)
  5/25/73   0200-0400     3502. ( 6)   3157. ( 6)   3551. ( 6)   2540. ( 6)
  5/25/73   0400-0600     3009. ( 6)   2688. ( 6)   2910. ( 6)   2318. ( 6)
  5/25/73   0600-0800     3530. ( 6)   3145. ( 6)   3170. ( 6)   2504. ( 6)
  5/25/73   0800-1000     1948. ( 6)   1159. ( 6)    961. ( 6)    567. ( 6)
  5/25/73   1000-1200     1583. ( 6)   1258. ( 6)   1184. ( 6)    937. ( 6)
  5/25/73   1200-1400     2220. ( 4)   1887. ( 4)   1813. ( 4)   1813. ( 4)
  5/25/73   1400-1600       ******       ******       ******       ******
  5/25/73   1600-1800       ******       ******       ******       ******
  5/25/73   1800-2000       ******       ******       ******       ******
  5/25/73   2000-2200       ******       ******       ******       ******
  5/25/73   2200-2400       ******       ******       ******       ******
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Appendix B-2

NO_2, NO and CO data for House No. 1 - Fall/Winter

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HOUSE  -1   FALL-WINTER     NO2 AVERAGE CONCENTRATIONS , UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                   STATION
  DATE        TIME               1              1A                2                4
                             OVER STOVE 1M FROM STOVE LIV/                     OUTSIDE
 11/ 6/73   0000-0200          *******        *******         *******         *******
 11/ 6/73   0200-0400          ******          ******          ******          ******
 11/ 6/73   0400-0600          ******          ******          ******          ******
 11/ 6/73   0600-0800          ******          ******          ******          ******
 11/ 6/73   0800-1000          ******          ******          ******          ******
 11/ 6/73   1000-1200          ******          ******          ******          ******
 11/ 6/73   1200-1400          ******          ******          ******          ******
 11/ 6/73   1400-1600          ******          ******          ******          ******
 11/ 6/73   1600-1800       311.3 ( 3)     279.0 ( 3)     243.3 ( 3)     125.7 ( 3)
 11/ 6/73   1800-2000       208.2 ( 6)     143.0 ( 6)     164.5 ( 6)      35.3 ( 6)
 11/ 6/73   2000-2200        57.8 ( 6)      42.8 ( 6)      59.2 ( 6)      17.8 ( 6)
 11/ 6/73   2200-2400        33.8 ( 4)      32.0 ( 4)      24.8 ( 4)      13.3 ( 4)



 11/ 7/73   0000-0200        36.7 ( 6)      35.3 ( 6)      24.0 ( 6)      16.7 ( 6)
 11/ 7/73   0200-0400        36.5 ( 6)      34.8 ( 5)      25.3 ( 6)      15.2 ( 6)
 11/ 7/73   0400-0600        41.5 ( 6)      35.7 ( 6)      26.5 ( 6)      19.0 ( 6)
 11/ 7/73   0600-0800        40.2 ( 6)      34.0 ( 6)      36.3 ( 6)      25.3 ( 6)
 11/ 7/73   0800-1000        86.5 ( 6)      53.0 ( 6)      93.0 ( 6)      25.5 ( 5)
 11/ 7/73   1000-1200        46.5 ( 5)      42.8 ( 6)      32.8 ( 6)      25.2 ( 6)
 11/ 7/73   1200-1400        51.3 ( 6)      45.2 ( 6)      27.7 ( 6)      28.0 ( 6)
 11/ 7/73   1400-1600        87.8 ( 5)      50.3 ( 6)      41.5 ( 6)      32.8 ( 6)
 11/ 7/73   1600-1800       194.7 ( 6)     169.5 ( 6)     207.3 ( 6)      61.5 ( 6)
 11/ 7/73   1800-2000        71.3 ( 6)      72.7 ( 6)      59.2 ( 6)      75.3 ( 6)
 11/ 7/73   2000-2200        51.5 ( 6)      45.0 ( 6)      65.2 ( 6)      47.8 ( 6)
 11/ 7/73   2200-2400        61.5 ( 6)      48.8 ( 6)      63.0 ( 6)      42.8 ( 6)

DAILY AVERAGE =              67.2           55.7           58.5           34.6
 (AVG OF 24R VALUES)


 11/ 8/73   0000-0200        50.2 ( 6)      45.0 ( 6)      59.2 ( 6)      44.0 ( 6)
 11/ 8/73   0200-0400        55.3 ( 6)      46.3 ( 6)      54.0 ( 6)      56.5 ( 6)
 11/ 8/73   0400-0600        52.8 ( 6)      46.5 ( 6)      56.7 ( 6)      64.0 ( 6)
 11/ 8/73   0600-0800        81.7 ( 6)      56.5 ( 6)      72.8 ( 6)      74.0 ( 6)
 11/ 8/73   0800-1000        55.3 ( 6)      49.0 ( 6)      62.8 ( 6)      45.3 ( 6)
 11/ 8/73   1000-1200        62.7 ( 5)      47.0 ( 4)      77.8 ( 6)      48.8 ( 6)
 11/ 8/73   1200-1400        61.5 ( 6)      50.3 ( 6)      72.7 ( 6)      41.5 ( 5)
 11/ 8/73   1400-1600       188.3 ( 3)     105.3 ( 3)     110.7 ( 3)      37.7 ( 3)
 11/ 8/73   1600-1800       307.7 ( 6)     247.3 ( 6)     316.5 ( 6)     101.5 ( 6)
 11/ 8/73   1800-2000       109.3 ( 6)      97.7 ( 6)     111.7 ( 6)      64.0 ( 6)
 11/ 8/73   2000-2200        82.7 ( 6)      65.3 ( 6)      87.8 ( 6)      53.8 ( 6)
 11/ 8/73   2200-2400        62.7 ( 6)      70.2 ( 6)      81.5 ( 6)      52.7 ( 6)

DAILY AVERAGE =              97.5           77.2           97.0           57.0
 (AVG OF 24R VALUES)
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HOUSE  -1   FALL-WINTER      NO2 AVERAGE CONCENTRATIONS , UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                     STATION
  DATE          TIME            1               1A              2                4
                           OVER STOVE 1M FROM STOVE LIV/                     OUTSIDE

11/ 9/73   0000-0200       51.5 ( 6)     45.0 ( 6)      67.5 ( 6)      36.3 ( 6)
11/ 9/73   0200-0400       49.0 ( 6)     45.0 ( 6)      46.3 ( 6)      21.2 ( 5)
11/ 9/73   0400-0600       52.7 ( 6)     41.3 ( 6)      37.5 ( 6)      22.7 ( 6)
11/ 9/73   0600-0800       59.0 ( 6)     50.5 ( 6)      50.3 ( 6)      37.7 ( 6)
11/ 9/73   0800-1000       57.8 ( 6)     49.0 ( 6)      45.3 ( 6)      30.2 ( 6)
11/ 9/73   1000-1200        ******        ******         ******         ******
11/ 9/73   1200-1400      251.8 ( 4)     87.8 ( 5)      34.5 ( 4)      17.6 ( 5)
11/ 9/73   1400-1600       36.5 ( 6)     32.7 ( 6)      17.7 ( 6)      10.3 ( 6)
11/ 9/73   1600-1800       44.0 ( 6)     42.7 ( 6)      21.5 ( 6)      29.2 ( 6)
11/ 9/73   1800-2000       30.2 ( 6)     30.2 ( 6)      25.3 ( 6)      21.7 ( 6)
11/ 9/73   2000-2200       40.2 ( 6)     37.7 ( 6)      17.7 ( 6)      16.3 ( 6)
11/ 9/73   2200-2400       22.8 ( 6)     26.5 ( 6)      10.3 ( 6)      15.0 ( 6)




11/10/73   0000-0200       22.9 ( 7)     24.0 ( 7)      14.0 ( 7)      15.0 ( 7)
11/10/73   0200-0400       24.2 ( 6)     23.0 ( 6)      11.5 ( 6)      15.0 ( 6)
11/10/73   0400-0600       18.2 ( 5)     23.0 ( 5)      10.8 ( 5)      15.0 ( 5)
11/10/73   0600-0800       26.7 ( 6)     22.8 ( 6)      15.0 ( 6)      15.0 ( 6)
11/10/73   0800-1000       37.8 ( 6)     30.3 ( 6)      12.7 ( 6)      16.3 ( 6)
11/10/73   1000-1200       26.5 ( 6)     30.0 ( 6)      15.0 ( 6)      16.3 ( 6)
11/10/73   1200-1400       29.0 ( 6)     30.2 ( 6)      17.7 ( 6)      17.7 ( 6)
11/10/73   1400-1600       25.3 ( 6)     25.3 ( 6)       9.2 ( 6)      16.3 ( 6)
11/10/73   1600-1800       24.2 ( 6)     27.7 ( 6)      16.3 ( 6)      25.2 ( 6)
11/10/73   1800-2000       33.8 ( 6)     32.7 ( 6)      24.2 ( 6)      26.5 ( 6)
11/10/73   2000-2200       36.5 ( 6)     37.8 ( 6)      20.3 ( 6)      24.2 ( 6)
11/10/73   2200-2400       30.0 ( 6)     31.3 ( 6)      25.2 ( 6)      31.5 ( 6)

DAILY AVERAGE =            27.9          28.2           16.0           19.5
 (AVG OF 2HR VALUES)


11/11/73   0000-0200       30.0 ( 6)     28.8 ( 6)      25.2 ( 6)      28.8 ( 6)
11/11/73   0200-0400       28.8 ( 6)     27.7 ( 6)      23.0 ( 6)      32.7 ( 6)
11/11/73   0400-0600       28.8 ( 6)     30.0 ( 6)      30.2 ( 6)      34.0 ( 6)
11/11/73   0600-0800       54.0 ( 6)     41.5 ( 6)      29.0 ( 6)      30.0 ( 6)
11/11/73   0800-1000       32.7 ( 6)     33.8 ( 6)      24.0 ( 6)      27.7 ( 6)
11/11/73   1000-1200       55.2 ( 6)     35.2 ( 6)      24.2 ( 6)      16.5 ( 6)
11/11/73   1200-1400      145.7 ( 6)     36.5 ( 6)      44.0 ( 6)      10.8 ( 5)
11/11/73   1400-1600       94.2 ( 6)     84.2 ( 6)      30.3 ( 6)      18.2 ( 5)
11/11/73   1600-1800      143.3 ( 6)    145.8 ( 6)      65.2 ( 6)      43.8 ( 6)
11/11/73   1800-2000       56.3 ( 6)     56.5 ( 6)      41.5 ( 6)      46.5 ( 6)
11/11/73   2000-2200       36.5 ( 6)     37.8 ( 6)      32.7 ( 6)      40.3 ( 6)
11/11/73   2200-2400       35.3 ( 6)     38.0 ( 6)      33.3 ( 6)      56.3 ( 6)

DAILY AVERAGE =            61.7          49.7           33.5           32.1
 (AVG OF 2HR VALUES)
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HOUSE  #1   FALL-WINTER      NO2 AVERAGE CONCENTRATIONS , UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                   STATION
   DATE        TIME             1             1A            2              4
                           OVER STOVE 1M FROM STOVE LIV/              OUTSIDE

11/12/73   0000-0200        39.2 ( 6)     36.7 ( 6)     35.3 ( 6)     52.7 ( 6)
11/12/73   0200-0400        70.3 ( 6)     30.0 ( 6)     34.0 ( 6)     36.7 ( 6)
11/12/73   0400-0600        39.0 ( 6)     32.7 ( 6)     32.7 ( 6)     41.7 ( 6)
11/12/73   0600-0800        50.3 ( 6)     45.2 ( 6)     34.0 ( 6)     44.0 ( 6)
11/12/73   0800-1000        39.8 ( 4)     39.5 ( 4)     38.0 ( 4)     49.3 ( 4)
11/12/73   1000-1200        68.2 ( 5)     46.0 ( 5)     42.0 ( 5)     42.0 ( 5)
11/12/73   1200-1400        45.0 ( 6)     46.7 ( 6)     28.3 ( 6)     38.3 ( 6)
11/12/73   1400-1600        61.7 ( 6)     53.3 ( 6)     48.3 ( 6)     53.3 ( 6)
11/12/73   1600-1800       115.3 ( 6)    132.2 ( 6)     51.7 ( 6)     90.2 ( 6)
11/12/73   1800-2000       168.8 ( 6)    155.7 ( 6)     98.5 ( 6)    114.0 ( 6)
11/12/73   2000-2200        88.5 ( 6)     83.3 ( 6)     93.3 ( 6)    125.2 ( 6)
11/12/73   2200-2400        60.0 ( 6)     61.7 ( 6)     70.0 ( 6)     76.7 ( 6)

DAILY AVERAGE =             70.5          63.6          50.5          63.7
 (AVG OF 2HR VALUES)


11/13/73   0000-0200        73.3 ( 6)     65.0 ( 6)     61.7 ( 6)     76.7 ( 6)
11/13/73   0200-0400        56.7 ( 6)     60.0 ( 6)     53.3 ( 6)     75.0 ( 6)
11/13/73   0400-0600        60.0 ( 6)     48.3 ( 6)     48.3 ( 6)     65.0 ( 6)
11/13/73   0600-0800        65.0 ( 6)    105.3 ( 6)     61.7 ( 6)     65.0 ( 6)
11/13/73   0800-1000        65.0 ( 6)     53.3 ( 6)     50.0 ( 6)     60.0 ( 6)
11/13/73   1000-1200        65.0 ( 6)     53.3 ( 6)     50.0 ( 6)     61.7 ( 6)
11/13/73   1200-1400        70.0 ( 6)     61.7 ( 6)     50.0 ( 6)     71.7 ( 6)
11/13/73   1400-1600        86.7 ( 6)     65.0 ( 6)     61.7 ( 6)    108.5 ( 6)
11/13/73   1600-1800       135.8 ( 6)    338.2 ( 6)    227.5 ( 6)    157.7 ( 6)
11/13/73   1800-2000       122.5 ( 6)    157.3 ( 6)    139.0 ( 6)    132.5 ( 6)
11/13/73   2000-2200        86.7 ( 6)     70.0 ( 6)     71.7 ( 6)     90.0 ( 6)
11/13/73   2200-2400        76.7 ( 6)     65.0 ( 6)     60.0 ( 6)     73.3 ( 6)

DAILY AVERAGE =             84.4          95.2          77.9          86.4
 (AVG OF 2HR VALUES)


11/14/73   0000-0200        68.3 ( 6)     50.0 ( 6)     50.0 ( 6)     70.0 ( 6)
11/14/73   0200-0400        70.0 ( 6)     53.3 ( 6)     50.0 ( 6)     70.0 ( 6)
11/14/73   0400-0600        70.0 ( 6)     60.0 ( 6)     48.3 ( 6)     58.3 ( 6)
11/14/73   0600-0800        83.5 ( 6)     73.3 ( 6)     81.8 ( 6)     81.7 ( 6)
11/14/73   0800-1000        77.5 ( 4)     62.5 ( 4)     60.0 ( 4)     67.5 ( 4)
11/14/73   1000-1200        58.0 ( 5)     40.0 ( 5)     40.0 ( 5)     48.0 ( 5)
11/14/73   1200-1400        35.0 ( 6)     40.0 ( 6)     40.0 ( 6)     30.0 ( 6)
11/14/73   1400-1600        41.7 ( 6)     43.3 ( 6)     40.0 ( 6)     30.0 ( 6)
11/14/73   1600-1800        58.3 ( 6)     60.0 ( 6)     50.0 ( 6)     60.0 ( 6)
11/14/73   1800-2000        65.0 ( 6)     60.0 ( 6)     58.3 ( 6)     60.0 ( 6)
11/14/73   2000-2200        56.7 ( 6)     50.0 ( 6)     48.3 ( 6)     66.7 ( 6)
11/14/73   2200-2400        64.0 ( 5)     48.3 ( 6)     41.7 ( 6)     51.7 ( 6)

DAILY AVERAGE =             62.3          53.4          50.7          57.8
 (AVG OF 2HR VALUES)
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HOUSE  -1   FALL-WINTER     NO2 AVERAGE CONCENTRATIONS , UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                             STATION
  DATE        TIME             1             1A             3             4
                           OVER STOVE 1M FROM STOVE      /BD RM       OUTSIDE

11/15/73   0000-0200       61.7 ( 6)    53.3 ( 6)    45.0 ( 6)    58.3 ( 6)
11/15/73   0200-0400       81.7 ( 6)    58.3 ( 6)    45.0 ( 6)    87.0 ( 6)
11/15/73   0400-0600       60.0 ( 6)    55.0 ( 6)    41.7 ( 6)    51.7 ( 6)
11/15/73   0600-0800       86.8 ( 6)    87.0 ( 6)    78.5 ( 6)    60.0 ( 6)
11/15/73   0800-1000      114.2 ( 6)    73.3 ( 6)    65.0 ( 6)    75.0 ( 6)
11/15/73   1000-1200       97.0 ( 6)    58.3 ( 6)    51.7 ( 6)    65.0 ( 6)
11/15/73   1200-1400       80.0 ( 6)    65.0 ( 6)    65.0 ( 6)    65.0 ( 6)
11/15/73   1400-1600      104.4 ( 5)    74.0 ( 5)    80.0 ( 5)   106.6 ( 5)
11/15/73   1600-1800       85.0 ( 6)    70.0 ( 6)    73.3 ( 6)    83.5 ( 6)
11/15/73   1800-2000       85.0 ( 6)    66.7 ( 6)    75.2 ( 6)    70.0 ( 6)
11/15/73   2000-2200       91.7 ( 6)    60.0 ( 6)    51.7 ( 6)    56.7 ( 6)
11/15/73   2200-2400       65.0 ( 6)    53.3 ( 6)    41.7 ( 6)    53.3 ( 6)

DAILY AVERAGE =            84.4         64.5         59.5         69.3
 (AVG OF 2HR VALUES)


11/16/73   0000-0200       71.7 ( 6)    58.3 ( 6)    46.7 ( 6)    60.0 ( 6)
11/16/73   0200-0400       75.0 ( 6)    60.0 ( 6)    50.0 ( 6)    61.7 ( 6)
11/16/73   0400-0600       58.3 ( 6)    51.7 ( 6)    40.0 ( 6)    60.0 ( 6)
11/16/73   0600-0800       90.2 ( 6)    78.7 ( 6)    43.3 ( 6)    56.7 ( 6)
11/16/73   0800-1000       85.0 ( 6)    63.3 ( 6)    40.0 ( 6)    38.3 ( 6)
11/16/73   1000-1200       46.7 ( 6)    46.7 ( 6)    40.0 ( 6)    35.0 ( 6)
11/16/73   1200-1400       48.3 ( 6)    46.7 ( 6)    40.0 ( 6)    23.3 ( 6)
11/16/73   1400-1600       46.7 ( 3)    40.0 ( 3)    33.3 ( 3)    20.0 ( 3)
11/16/73   1600-1800       80.2 ( 5)   102.0 ( 6)    58.5 ( 6)    23.3 ( 6)
11/16/73   1800-2000       50.0 ( 6)    55.0 ( 6)    43.3 ( 6)    20.0 ( 6)
11/16/73   2000-2200       60.0 ( 6)    51.7 ( 6)    43.3 ( 6)    15.0 ( 6)
11/16/73   2200-2400       40.0 ( 6)    41.7 ( 6)    36.7 ( 6)    21.7 ( 6)

DAILY AVERAGE =            62.7         58.0         42.9         36.2
 (AVG OF 2HR VALUES)


11/17/73   0000-0200       38.3 ( 6)    40.0 ( 6)    28.3 ( 6)    15.0 ( 6)
11/17/73   0200-0400       41.7 ( 6)    40.0 ( 6)    23.3 ( 6)    16.7 ( 6)
11/17/73   0400-0600       36.7 ( 6)    40.0 ( 6)    20.0 ( 6)    10.0 ( 6)
11/17/73   0600-0800       35.0 ( 6)    56.8 ( 6)    23.3 ( 6)    16.7 ( 6)
11/17/73   0800-1000       50.0 ( 6)    45.0 ( 6)    23.3 ( 6)    18.0 ( 5)
11/17/73   1000-1200       51.7 ( 6)    83.5 ( 6)    28.3 ( 6)    12.0 ( 5)
11/17/73   1200-1400       45.0 ( 6)    40.0 ( 6)    40.0 ( 6)    15.0 ( 6)
11/17/73   1400-1600       43.3 ( 6)    36.7 ( 6)    23.3 ( 6)    16.7 ( 6)
11/17/73   1600-1800      477.2 ( 6)   246.2 ( 6)    65.0 ( 6)    20.0 ( 6)
11/17/73   1800-2000       56.7 ( 6)    48.3 ( 6)    38.3 ( 6)    31.7 ( 6)
11/17/73   2000-2200       85.2 ( 6)    50.0 ( 6)    30.0 ( 6)    25.0 ( 6)
11/17/73   2200-2400       58.3 ( 6)    53.3 ( 6)    35.0 ( 6)    23.3 ( 6)

DAILY AVERAGE =            84.9         65.0         31.5         18.3
 (AVG OF 2HR VALUES)
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HOUSE  -1   FALL-WINTER     NO2 AVERAGE CONCENTRATIONS , UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                    STATION
   DATE        TIME            1             1A               3             4
                         OVER STOVE 1M FROM STOVE        /BD RM       OUTSIDE

11/18/73  0000-0200       60.0 ( 6)     53.3 ( 6)      45.0 ( 6)     26.7 ( 6)
11/18/73  0200-0400       56.7 ( 6)     48.3 ( 6)      33.3 ( 6)     23.3 ( 6)
11/18/73  0400-0600       46.7 ( 6)     43.3 ( 6)      30.0 ( 6)     20.0 ( 6)
11/18/73  0600-0800       50.0 ( 6)     43.3 ( 6)      26.7 ( 6)     20.0 ( 6)
11/18/73  0800-1000       88.5 ( 6)    115.3 ( 6)      43.3 ( 6)     18.3 ( 6)
11/18/73  1000-1200       56.7 ( 6)     48.3 ( 6)      33.3 ( 6)     18.3 ( 6)
11/18/73  1200-1400       61.7 ( 6)     68.5 ( 6)      35.0 ( 6)     21.7 ( 6)
11/18/73  1400-1600       48.3 ( 6)     85.2 ( 6)      36.7 ( 6)     26.7 ( 6)
11/18/73  1600-1800       86.8 ( 6)     60.0 ( 6)      41.7 ( 6)     38.3 ( 6)
11/18/73  1800-2000       71.7 ( 6)     45.0 ( 6)      38.3 ( 6)     45.0 ( 6)
11/18/73  2000-2200       88.5 ( 6)     56.7 ( 6)      36.7 ( 6)     43.3 ( 6)
11/18/73  2200-2400       88.3 ( 6)     48.3 ( 6)      38.3 ( 6)     40.0 ( 6)

DAILY AVERAGE =           67.0          60.5           36.5          28.5
 (AVG OF 2HR VALUES)


11/19/73  0000-0200       63.3 ( 6)     50.0 ( 6)      36.7 ( 6)     43.3 ( 6)
11/19/73  0200-0400       63.3 ( 6)     55.0 ( 6)      35.0 ( 6)     61.7 ( 6)
11/19/73  0400-0600       68.3 ( 6)     45.0 ( 6)      30.0 ( 6)     43.3 ( 6)
11/19/73  0600-0800       65.0 ( 6)     80.2 ( 6)      40.0 ( 6)     43.3 ( 6)
11/19/73  0800-1000       65.0 ( 2)     55.0 ( 2)      40.0 ( 2)     35.0 ( 2)
11/19/73  1000-1200       70.0 ( 6)     55.0 ( 6)      40.0 ( 6)     41.7 ( 6)
11/19/73  1200-1400       60.0 ( 3)     56.7 ( 3)      40.0 ( 3)     40.0 ( 3)
11/19/73  1400-1600      978.4 ( 5)    528.2 ( 5)      90.4 ( 5)     28.0 ( 5)
11/19/73  1600-1800      319.3 ( 6)    309.8 ( 6)     152.7 ( 6)     63.3 ( 6)
11/19/73  1800-2000       80.0 ( 6)     70.0 ( 6)      56.7 ( 6)     36.7 ( 6)
11/19/73  2000-2200      107.3 ( 6)     61.7 ( 6)      41.7 ( 6)     43.3 ( 6)
11/19/73  2200-2400       81.8 ( 6)     56.7 ( 6)      38.3 ( 6)     46.7 ( 6)

DAILY AVERAGE =          218.5         118.6           53.4          43.9
 (AVG OF 2HR VALUES)


11/20/73  0000-0200      172.8 ( 4)     90.0 ( 6)      74.7 ( 6)     71.5 ( 6)
11/20/73  0200-0400      107.2 ( 6)     46.7 ( 6)      31.7 ( 6)     35.0 ( 6)
11/20/73  0400-0600       58.3 ( 6)     41.7 ( 6)      25.0 ( 6)     33.3 ( 6)
11/20/73  0600-0800       63.3 ( 6)     45.0 ( 6)      31.7 ( 6)     83.7 ( 6)
11/20/73  0800-1000      197.7 ( 6)    128.7 ( 6)      61.8 ( 6)     53.3 ( 6)
11/20/73  1000-1200       76.7 ( 6)     58.3 ( 6)      40.0 ( 6)     43.3 ( 6)
11/20/73  1200-1400      103.7 ( 6)     46.7 ( 6)      43.3 ( 6)     38.3 ( 6)
11/20/73  1400-1600       78.3 ( 6)     60.0 ( 6)      38.3 ( 6)     43.3 ( 6)
11/20/73  1600-1800      341.3 ( 6)    304.7 ( 6)     123.8 ( 6)     51.7  ( 6)
11/20/73  1800-2000      202.7 ( 6)    145.7 ( 6)     165.8 ( 6)     78.5  ( 6)
11/20/73  2000-2200      118.8 ( 6)     66.7 ( 6)     143.8 ( 6)     50.0  ( 6)
11/20/73  2200-2400      152.3 ( 6)     91.8 ( 6)      71.8 ( 6)     58.3 ( 6)

DAILY AVERAGE =          139.4          93.8           49.9          74.5
 (AVG OF 2HR VALUES)
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HOUSE  -1   FALL-WINTER     NO2 AVERAGE CONCENTRATIONS , UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                  STATION
  DATE        TIME             1             1A               3             4
                          OVER STOVE 1M FROM STOVE        /BD RM        OUTSIDE

11/21/73   0000-0200      117.0 ( 6)     60.0 ( 6)     43.3 ( 6)     63.3 ( 6)
11/21/73   0200-0400      125.5 ( 6)    134.4 ( 6)     81.8 ( 6)     51.7 ( 5)
11/21/73   0400-0600      162.5 ( 6)    111.8 ( 6)     55.0 ( 4)     52.8 ( 6)
11/21/73   0600-0800      113.8 ( 6)    137.2 ( 6)     60.0 ( 2)     35.0 ( 6)
11/21/73   0800-1000      138.8 ( 6)     90.2 ( 6)     60.0 ( 6)     76.7 ( 6)
11/21/73   1000-1200      127.0 ( 3)     50.0 ( 3)     30.0 ( 3)     83.7 ( 3)
11/21/73   1200-1400        ******        ******        ******        ******
11/21/73   1400-1600        ******        ******        ******        ******
11/21/73   1600-1800        ******        ******        ******        ******
11/21/73   1800-2000        ******        ******        ******        ******
11/21/73   2000-2200        ******        ******        ******        ******
11/21/73   2200-2400        ******        ******        ******        ******
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HOUSE  -1   FALL-WINTER  NO     AVERAGE CONCENTRATIONS , UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                         STATION
   DATE          TIME               1                  1A             2                4
                                OVER STOVE 1M FROM STOVE LIV/    RM      OUTSIDE

 11/ 7/73   0000-0200          29.5 ( 6)     27.0 ( 6)     15.8 ( 6)      9.2 ( 6)
 11/ 7/73   0200-0400          26.3 ( 3)     21.3 ( 4)     18.3 ( 3)      8.3 ( 3)
 11/ 7/73   0400-0600          29.3 ( 6)     23.3 ( 6)     19.2 ( 6)      8.0 ( 5)
 11/ 7/73   0600-0800          29.6 ( 5)     25.8 ( 5)     20.8 ( 5)     11.0 ( 5)
 11/ 7/73   0800-1000         123.0 ( 2)     88.5 ( 2)    218.5 ( 2)     22.5 ( 2)
 11/ 7/73   1000-1200          31.8 ( 6)     23.2 ( 6)     25.7 ( 6)     13.3 ( 6)
 11/ 7/73   1200-1400          34.7 ( 6)     19.8 ( 6)     19.2 ( 6)     10.0 ( 6)
 11/ 7/73   1400-1600          65.5 ( 6)     37.5 ( 6)     27.7 ( 6)     16.5 ( 6)
 11/ 7/73   1600-1800         324.0 ( 6)    212.8 ( 6)    245.2 ( 6)     26.3 ( 5)
 11/ 7/73   1800-2000         160.8 ( 6)    176.0 ( 6)     99.7 ( 6)     53.2 ( 6)
 11/ 7/73   2000-2200         110.5 ( 6)    115.5 ( 6)     79.7 ( 6)     31.7 ( 6)
 11/ 7/73   2200-2400         129.7 ( 6)    130.5 ( 6)     89.0 ( 6)     51.3 ( 6)

 DAILY AVERAGE =               91.2          75.1          73.2          21.8
  (AVG OF 24R VALUES)


 11/ 8/73   0000-0200         106.3 ( 6)    108.0 ( 5)     74.0 ( 6)     48.3 ( 6)
 11/ 8/73   0200-0400         107.2 ( 6)    107.2 ( 6)     92.7 ( 6)    103.2 ( 6)
 11/ 8/73   0400-0600         154.2 ( 6)    150.8 ( 6)    156.5 ( 6)    216.5 ( 6)
 11/ 8/73   0600-0800         274.3 ( 6)    244.8 ( 6)    252.3 ( 6)    272.0 ( 6)
 11/ 8/73   0800-1000         244.2 ( 6)    237.5 ( 6)    213.7 ( 6)    136.0 ( 6)
 11/ 8/73   1000-1200         206.0 ( 2)    115.3 ( 4)    174.5 ( 2)     59.0 ( 2)
 11/ 8/73   1200-1400         126.2 ( 6)    126.5 ( 6)    103.2 ( 6)     52.5 ( 6)
 11/ 8/73   1400-1600         226.0 ( 3)    160.7 ( 3)    140.7 ( 3)     42.7 ( 3)
 11/ 8/73   1600-1800         430.0 ( 6)    416.8 ( 5)    338.2 ( 6)     34.2 ( 6)
 11/ 8/73   1800-2000         269.3 ( 6)    281.8 ( 6)    161.2 ( 6)     49.0 ( 6)
 11/ 8/73   2000-2200         179.3 ( 6)    188.3 ( 6)    118.0 ( 6)     41.7 ( 6)
 11/ 8/73   2200-2400         154.8 ( 6)    153.2 ( 6)     94.0 ( 6)     27.8 ( 6)

 DAILY AVERAGE =              206.5         190.9         159.9          90.2
  (AVG OF 24R VALUES)
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HOUSE  -1   FALL-WINTER  NO      AVERAGE CONCENTRATIONS , UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                      STATION
  DATE         TIME           1                1A              2              4
                          OVER STOVE 1M FROM STOVE LIV      RM       OUTSIDE

11/ 9/73   0000-0200      104.8 ( 6)    100.0 ( 6)     77.3 ( 6)     17.5 ( 6)
11/ 9/73   0200-0400       76.3 ( 6)     73.7 ( 6)     54.8 ( 6)      5.0 ( 3)
11/ 9/73   0400-0600       31.8 ( 6)     31.7 ( 6)     24.0 ( 6)      6.3 ( 4)
11/ 9/73   0600-0800       23.8 ( 5)     13.0 ( 5)     25.8 ( 5)      6.0 ( 5)
11/ 9/73   0800-1000       29.5 ( 6)     19.8 ( 5)     22.8 ( 5)     11.7 ( 3)
11/ 9/73   1000-1200        ******        ******        ******        ******
11/ 9/73   1200-1400      261.3 ( 4)    109.8 ( 5)     26.8 ( 4)     17.0 ( 5)
11/ 9/73   1400-1600       28.7 ( 6)     27.7 ( 6)      9.2 ( 6)      8.3 ( 6)
11/ 9/73   1600-1800       64.7 ( 6)     49.2 ( 6)     15.0 ( 3)      8.3 ( 6)
11/ 9/73   1800-2000       28.5 ( 6)     30.8 ( 6)     14.2 ( 6)      9.2 ( 6)
11/ 9/73   2000-2200       28.0 ( 6)     23.8 ( 6)     10.0 ( 6)     12.5 ( 6)
11/ 9/73   2200-2400       15.0 ( 6)     13.3 ( 6)      9.2 ( 6)      8.3 ( 6)




11/10/73   0000-0200       17.1 ( 7)     15.0 ( 7)     10.0 ( 7)     10.7 ( 7)
11/10/73   0200-0400       15.0 ( 6)     15.0 ( 6)     10.0 ( 6)     10.0 ( 6)
11/10/73   0400-0600       15.0 ( 5)     14.0 ( 5)     10.0 ( 5)     10.0 ( 5)
11/10/73   0600-0800       21.5 ( 6)     16.5 ( 6)     10.0 ( 6)     11.7 ( 6)
11/10/73   0800-1000       33.7 ( 6)     26.2 ( 6)     12.5 ( 6)     15.0 ( 6)
11/10/73   1000-1200       20.8 ( 6)     19.2 ( 6)     13.3 ( 6)     15.0 ( 6)
11/10/73   1200-1400       19.0 ( 6)     20.7 ( 6)     12.5 ( 6)     17.5 ( 6)
11/10/73   1400-1600       15.8 ( 6)     15.0 ( 6)     11.7 ( 6)     13.3 ( 6)
11/10/73   1600-1800       20.8 ( 6)     17.5 ( 6)     10.0 ( 6)     12.5 ( 6)
11/10/73   1800-2000       20.8 ( 6)     21.7 ( 6)     12.5 ( 6)     15.0 ( 6)
11/10/73   2000-2200       23.7 ( 6)     29.5 ( 6)     13.3 ( 6)     16.7 ( 6)
11/10/73   2200-2400       30.7 ( 6)     32.3 ( 6)     15.8 ( 6)     20.0 ( 6)

DAILY AVERAGE =            21.2          20.2          11.8          13.9
 (AVG OF 24R VALUES)


11/11/73   0000-0200       30.8 ( 6)     30.7 ( 6)     16.7 ( 6)     18.3 ( 6)
11/11/73   0200-0400       34.0 ( 6)     34.0 ( 6)     23.2 ( 6)     27.0 ( 6)
11/11/73   0400-0600       31.5 ( 6)     30.7 ( 6)     19.2 ( 6)     15.8 ( 6)
11/11/73   0600-0800       51.5 ( 6)     54.7 ( 6)     19.2 ( 6)     21.5 ( 6)
11/11/73   0800-1000       63.8 ( 6)     57.3 ( 6)     27.0 ( 6)     23.0 ( 6)
11/11/73   1000-1200       65.5 ( 6)     50.7 ( 6)     22.3 ( 6)     16.7 ( 6)
11/11/73   1200-1400       82.4 ( 5)     98.8 ( 6)     35.3 ( 6)     16.7 ( 6)
11/11/73   1400-1600      176.8 ( 6)    175.3 ( 6)     51.5 ( 6)     20.7 ( 6)
11/11/73   1600-1800      423.3 ( 6)    460.2 ( 6)    140.2 ( 6)     24.7 ( 6)
11/11/73   1800-2000      220.3 ( 6)    237.3 ( 6)     99.0 ( 6)     45.7 ( 6)
11/11/73   2000-2200      150.5 ( 6)    136.2 ( 6)    102.2 ( 6)    100.7 ( 6)
11/11/73   2200-2400      181.0 ( 6)    191.7 ( 6)    164.5 ( 6)    225.2 ( 6)

DAILY AVERAGE =           126.0         129.8          60.0          46.3
 (AVG OF 24R VALUES)
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HOUSE  -1   FALL-WINTER  NO      AVERAGE CONCENTRATIONS , UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                      STATION
   DATE        TIME              1              1A             2                4
                           OVER STOVE 1M FROM STOVE LIV        RM        OUTSIDE

 11/12/73   0000-0200      187.7 ( 6)   191.7 ( 6)   159.8 ( 6)   144.2 ( 6)
 11/12/73   0200-0400      160.5 ( 6)   158.8 ( 6)   131.2 ( 6)   108.0 ( 6)
 11/12/73   0400-0600      138.8 ( 6)   141.2 ( 6)   116.3 ( 6)   128.7 ( 6)
 11/12/73   0600-0800      167.2 ( 6)   162.2 ( 6)   137.2 ( 6)   144.2 ( 6)
 11/12/73   0800-1000      206.5 ( 4)   159.5 ( 4)   190.3 ( 4)   220.0 ( 4)
 11/12/73   1000-1200      177.0 ( 5)   176.8 ( 5)   120.6 ( 5)    35.4 ( 5)
 11/12/73   1200-1400       87.3 ( 6)   101.7 ( 6)    63.3 ( 6)    28.2 ( 6)
 11/12/73   1400-1600       52.5 ( 6)    57.8 ( 6)    29.5 ( 6)    32.8 ( 6)
 11/12/73   1600-1800      174.5 ( 6)   238.3 ( 6)   104.0 ( 6)   128.0 ( 6)
 11/12/73   1800-2000      375.7 ( 6)   386.7 ( 6)   188.8 ( 6)   118.0 ( 6)
 11/12/73   2000-2200      261.3 ( 6)   285.0 ( 6)   169.0 ( 6)   134.3 ( 6)
 11/12/73   2200-2400      213.0 ( 6)   225.0 ( 6)   131.2 ( 6)   124.7 ( 6)

 DAILY AVERAGE =           183.5        190.4        128.4        112.2
  (AVG OF 2HR VALUES)


 11/13/73   0000-0200      168.0 ( 6)   180.0 ( 6)   114.7 ( 6)    94.0 ( 6)
 11/13/73   0200-0400      136.6 ( 5)   142.8 ( 5)    92.8 ( 6)    73.3 ( 6)
 11/13/73   0400-0600      121.5 ( 6)   123.7 ( 6)    88.5 ( 6)    73.5 ( 6)
 11/13/73   0600-0800      188.8 ( 6)   142.0 ( 6)   103.7 ( 6)   103.8 ( 6)
 11/13/73   0800-1000      152.8 ( 6)   157.2 ( 6)   114.5 ( 6)    86.3 ( 6)
 11/13/73   1000-1200      123.5 ( 6)   126.0 ( 5)    88.5 ( 6)    70.0 ( 6)
 11/13/73   1200-1400      114.5 ( 6)   120.3 ( 6)    87.2 ( 6)    86.3 ( 6)
 11/13/73   1400-1600      134.5 ( 6)   144.3 ( 6)   112.7 ( 6)   103.7 ( 6)
 11/13/73   1600-1800      575.7 ( 6)   548.2 ( 6)   277.5 ( 6)   166.0 ( 6)
 11/13/73   1800-2000      397.5 ( 6)   423.8 ( 6)   243.7 ( 6)   137.5 ( 6)
 11/13/73   2000-2200      265.5 ( 6)   296.2 ( 5)   194.5 ( 6)   123.7 ( 6)
 11/13/73   2200-2400      205.5 ( 6)   218.5 ( 6)   163.7 ( 6)    78.5 ( 6)

 DAILY AVERAGE =           215.4        218.6        140.2         99.9
  (AVG OF 2HR VALUES)


 11/14/73   0000-0200      136.7 ( 6)   144.2 ( 6)   105.8 ( 6)    43.7 ( 6)
 11/14/73   0200-0400      103.7 ( 6)   111.3 ( 6)    66.8 ( 6)    59.0 ( 6)
 11/14/73   0400-0600       85.2 ( 6)    91.7 ( 6)    51.2 ( 6)    30.5 ( 6)
 11/14/73   0600-0800      117.0 ( 6)   127.8 ( 6)    86.3 ( 6)    72.2 ( 6)
 11/14/73   0800-1000      126.5 ( 4)   137.8 ( 4)   101.5 ( 4)    70.5 ( 4)
 11/14/73   1000-1200      107.2 ( 5)   104.6 ( 5)   102.0 ( 5)    35.4 ( 5)
 11/14/73   1200-1400       68.0 ( 6)    64.5 ( 6)    56.8 ( 6)    17.5 ( 6)
 11/14/73   1400-1600       25.0 ( 6)    23.0 ( 6)    20.8 ( 6)    11.0 ( 6)
 11/14/73   1600-1800       64.2 ( 6)    58.8 ( 6)    62.3 ( 6)    36.0 ( 6)
 11/14/73   1800-2000      132.2 ( 6)   138.7 ( 6)    92.8 ( 6)    28.5 ( 6)
 11/14/73   2000-2200      131.0 ( 6)   141.8 ( 6)   117.0 ( 6)   129.0 ( 6)
 11/14/73   2200-2400      208.5 ( 6)   208.5 ( 6)   188.8 ( 6)   178.2 ( 6)

 DAILY AVERAGE =           108.8        112.7         87.7         59.3
  (AVG OF 2HR VALUES)
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HØUSE  -1   FALL-WINTER  NØ      AVERAGE CØNCENTRATIØNS , UG/M3
  VALUES IN ( ) ARE NØ. ØF ØBSERVATIØNS IN PERIØD
     MAX.: 6 PER 2HR,72 PER DAY

                                                  STATIØN
  DATE        TIME           1               1A               2                4
                         ØVER STØVE 1M FRØM STØVE LIV       RM      ØUTSIDE

11/15/73  0000-0200     206.7 ( 6)   209.8 ( 6)   195.5 ( 6)   162.7 ( 6)
11/15/73  0200-0400     193.3 ( 6)   199.0 ( 6)   163.7 ( 6)   142.0 ( 6)
11/15/73  0400-0600     203.3 ( 6)   201.2 ( 6)   183.5 ( 6)   178.0 ( 6)
11/15/73  0600-0800     216.3 ( 6)   220.8 ( 6)   184.5 ( 6)   180.3 ( 6)
11/15/73  0800-1000     207.5 ( 6)   216.3 ( 6)   163.7 ( 6)   171.3 ( 6)
11/15/73  1000-1200     175.7 ( 6)   181.3 ( 6)   111.7 ( 6)   103.8 ( 6)
11/15/73  1200-1400      85.2 ( 6)    91.8 ( 6)    75.7 ( 6)    60.0 ( 6)
11/15/73  1400-1600      71.0 ( 5)    57.6 ( 5)    52.4 ( 5)    32.6 ( 5)
11/15/73  1600-1800      84.3 ( 6)    69.8 ( 6)    52.2 ( 6)    36.2 ( 6)
11/15/73  1800-2000      94.0 ( 6)    79.8 ( 6)    58.8 ( 6)    47.7 ( 6)
11/15/73  2000-2200      72.2 ( 6)    70.0 ( 6)    42.5 ( 6)    39.2 ( 6)
11/15/73  2200-2400      79.0 ( 6)    58.0 ( 6)    60.2 ( 6)    29.3 ( 6)

DAILY AVERAGE =         140.7        138.0        112.0         98.6
 (AVG ØF 2HR VALUES)


11/16/73  0000-0200      59.0 ( 6)    73.3 ( 6)    31.5 ( 6)    13.0 ( 6)
11/16/73  0200-0400      57.8 ( 6)    74.5 ( 6)    42.5 ( 6)    26.0 ( 6)
11/16/73  0400-0600      77.7 ( 6)    88.5 ( 6)    64.7 ( 6)    44.7 ( 6)
11/16/73  0600-0800     122.3 ( 6)   144.0 ( 6)    73.3 ( 6)    37.0 ( 6)
11/16/73  0800-1000      89.7 ( 6)   106.2 ( 6)   100.5 ( 6)    17.5 ( 6)
11/16/73  1000-1200      66.5 ( 6)    79.0 ( 6)    77.8 ( 6)    25.3 ( 6)
11/16/73  1200-1400      54.5 ( 6)    49.0 ( 6)    51.3 ( 6)    16.5 ( 6)
11/16/73  1400-1600      30.7 ( 3)    26.0 ( 3)    24.0 ( 3)    13.0 ( 3)
11/16/73  1600-1800      93.0 ( 5)    98.5 ( 6)    53.7 ( 6)    15.2 ( 6)
11/16/73  1800-2000      65.7 ( 6)    76.7 ( 6)    76.5 ( 6)    13.0 ( 6)
11/16/73  2000-2200      39.2 ( 6)    39.0 ( 6)    41.5 ( 6)    21.8 ( 6)
11/16/73  2200-2400      31.7 ( 6)    26.2 ( 6)    17.5 ( 6)    17.5 ( 6)

DAILY AVERAGE =          65.6         73.4         54.6         21.7
 (AVG ØF 2HR VALUES)


11/17/73  0000-0200      28.2 ( 6)    24.2 ( 6)    13.0 ( 6)    13.0 ( 6)
11/17/73  0200-0400      28.3 ( 6)    26.0 ( 6)    13.0 ( 6)    10.0 ( 6)
11/17/73  0400-0600      28.3 ( 6)    26.0 ( 6)    13.0 ( 6)    10.0 ( 6)
11/17/73  0600-0800      33.0 ( 6)    67.5 ( 6)    14.2 ( 6)    12.0 ( 6)
11/17/73  0800-1000      39.2 ( 6)    39.2 ( 6)    26.2 ( 6)    18.5 ( 6)
11/17/73  1000-1200      41.3 ( 6)    72.2 ( 6)    25.0 ( 6)    14.2 ( 6)
11/17/73  1200-1400      35.0 ( 6)    25.2 ( 6)    16.3 ( 6)    14.2 ( 6)
11/17/73  1400-1600      24.0 ( 6)    16.5 ( 6)    12.0 ( 6)    11.0 ( 6)
11/17/73  1600-1800     377.8 ( 6)   351.5 ( 6)   121.2 ( 6)    29.3 ( 6)
11/17/73  1800-2000      84.3 ( 6)   103.3 ( 6)   116.8 ( 6)    18.7 ( 6)
11/17/73  2000-2200      71.2 ( 6)    84.3 ( 6)    79.8 ( 6)    17.5 ( 6)
11/17/73  2200-2400      55.5 ( 6)    73.3 ( 6)    67.8 ( 6)    16.3 ( 6)

DAILY AVERAGE =          70.5         76.2         43.2         15.4
 (AVG ØF 2HR VALUES)
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HOUSE  -1   FALL-WINTER  NO      AVERAGE CONCENTRATIONS , UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                  STATION
  DATE        TIME            1               1A              2               4
                          OVER STOVE  1M FROM STOVE         BD RM         OUTSIDE

11/18/73   0000-0200       38.0 ( 6)       41.2 ( 6)       32.7 ( 6)       13.0 ( 6)
11/18/73   0200-0400       32.7 ( 6)       26.2 ( 6)       16.3 ( 6)       14.2 ( 6)
11/18/73   0400-0600       32.8 ( 6)       23.8 ( 6)       13.0 ( 6)       13.0 ( 6)
11/18/73   0600-0800       30.7 ( 6)       22.8 ( 6)       13.0 ( 6)       13.0 ( 6)
11/18/73   0800-1000      131.0 ( 6)      141.0 ( 6)       49.3 ( 6)       16.3 ( 6)
11/18/73   1000-1200       45.8 ( 6)       38.0 ( 6)       25.0 ( 6)       13.0 ( 6)
11/18/73   1200-1400       34.8 ( 6)       43.5 ( 6)       33.8 ( 6)       15.3 ( 6)
11/18/73   1400-1600       43.5 ( 6)       81.7 ( 6)       33.7 ( 6)       13.0 ( 6)
11/18/73   1600-1800       86.3 ( 6)       75.3 ( 6)       68.8 ( 6)       25.2 ( 6)
11/18/73   1800-2000       80.0 ( 6)       82.2 ( 6)       82.2 ( 6)       57.0 ( 6)
11/18/73   2000-2200      140.8 ( 6)      112.5 ( 6)       99.5 ( 6)       33.8 ( 6)
11/18/73   2200-2400       85.3 ( 6)       88.7 ( 6)       87.7 ( 6)       27.2 ( 6)

DAILY AVERAGE =            65.2            64.7            46.2            21.2
 (AVG OF 2HR VALUES)


11/19/73   0000-0200       78.8 ( 6)       82.2 ( 6)       79.0 ( 6)       37.0 ( 6)
11/19/73   0200-0400       97.3 ( 6)       95.0 ( 6)       85.3 ( 6)      103.8 ( 6)
11/19/73   0400-0600      126.8 ( 6)      126.8 ( 6)      114.7 ( 6)       95.0 ( 6)
11/19/73   0600-0800      129.0 ( 6)      150.7 ( 6)      119.2 ( 6)       71.2 ( 6)
11/19/73   0800-1000      147.5 ( 2)      147.5 ( 2)      131.0 ( 2)       72.5 ( 2)
11/19/73   1000-1200      103.8 ( 6)       93.0 ( 6)       91.8 ( 6)       54.3 ( 6)
11/19/73   1200-1400       76.7 ( 3)       63.7 ( 3)       65.7 ( 3)       41.7 ( 3)
11/19/73   1400-1600      770.6 ( 5)      604.2 ( 5)      169.0 ( 5)       13.2 ( 5)
11/19/73   1600-1800      773.2 ( 6)      490.2 ( 6)      392.0 ( 6)       49.0 ( 6)
11/19/73   1800-2000      181.3 ( 6)      201.0 ( 6)      240.3 ( 6)       19.7 ( 6)
11/19/73   2000-2200      129.0 ( 6)      137.7 ( 6)      140.8 ( 6)       64.3 ( 6)
11/19/73   2200-2400      122.2 ( 6)      147.3 ( 6)      138.7 ( 6)      101.8 ( 6)

DAILY AVERAGE =           228.0           194.9           147.3            60.3
 (AVG OF 2HR VALUES)



11/20/73   0000-0200      150.8 ( 4)       97.2 ( 6)       96.0 ( 6)       59.0 ( 6)
11/20/73   0200-0400      113.7 ( 6)      111.5 ( 6)      107.2 ( 6)       26.2 ( 5)
11/20/73   0400-0600       82.2 ( 6)       70.3 ( 6)       72.5 ( 6)       19.7 ( 6)
11/20/73   0600-0800      108.2 ( 6)       99.5 ( 6)       76.7 ( 6)      170.5 ( 6)
11/20/73   0800-1000      233.8 ( 6)      299.5 ( 6)      200.8 ( 6)      107.2 ( 6)
11/20/73   1000-1200      164.8 ( 6)      150.7 ( 6)      169.2 ( 6)       48.2 ( 6)
11/20/73   1200-1400      121.3 ( 6)       98.5 ( 6)      109.2 ( 6)       20.7 ( 6)
11/20/73   1400-1600       81.0 ( 6)       59.2 ( 6)       79.0 ( 6)       20.5 ( 6)
11/20/73   1600-1800      351.7 ( 6)      458.8 ( 6)      211.8 ( 6)      276.3 ( 6)
11/20/73   1800-2000      452.0 ( 6)      474.8 ( 6)      446.7 ( 6)      492.5 ( 6)
11/20/73   2000-2200      506.8 ( 6)      491.3 ( 6)      486.0 ( 6)      529.7 ( 6)
11/20/73   2200-2400      452.2 ( 6)      480.7 ( 6)      458.7 ( 6)      281.8 ( 6)

DAILY AVERAGE =           234.9           241.0           209.5           171.0
 (AVG OF 2HR VALUES)
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HOUSE  -1   FALL-WINTER  NO      AVERAGE CONCENTRATIONS , UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                  STATION
   DATE        TIME             1                       2                  4
                                             1A
                           OVER STOVE 1M FROM STOVE  BEDROOM          OUTSIDE

11/21/73  0000-0200      357.0 ( 6)  356.0 ( 6)  322.3 ( 6)  300.2 ( 6)
11/21/73  0200-0400      301.5 ( 6)  296.0 ( 6)  196.7 ( 6)  194.5 ( 6)
11/21/73  0400-0600      281.7 ( 6)  258.0 ( 6)   95.2 ( 6)  254.5 ( 6)
11/21/73  0600-0800      336.5 ( 6)  309.2 ( 6)  131.2 ( 6)  317.7 ( 6)
11/21/73  0800-1000      372.5 ( 6)  342.0 ( 6)  322.5 ( 6)  299.2 ( 6)
11/21/73  1000-1200      356.0 ( 3)  231.7 ( 3)  223.0 ( 3)  221.0 ( 3)
11/21/73  1200-1400        ******      ******      ******      ******
11/21/73  1400-1600        ******      ******      ******      ******
11/21/73  1600-1800        ******      ******      ******      ******
11/21/73  1800-2000        ******      ******      ******      ******
11/21/73  2000-2200        ******      ******      ******      ******
11/21/73  2200-2400        ******      ******      ******      ******
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HOUSE  1   FALL-WINTER    CO AVERAGE CONCENTRATIONS ,UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                        STATION
   DATE         TIME            1               1A              2                4
                          OVER STOVE 1M FROM STOVE LIV/   RM      OUTSIDE

 11/ 6/73   0000-0200       ******          ******          ******          ******
 11/ 6/73   0200-0400       ******          ******          ******          ******
 11/ 6/73   0400-0600       ******          ******          ******          ******
 11/ 6/73   0600-0800       ******          ******          ******          ******
 11/ 6/73   0800-1000       ******          ******          ******          ******
 11/ 6/73   1000-1200       ******          ******          ******          ******
 11/ 6/73   1200-1400       ******          ******          ******          ******
 11/ 6/73   1400-1600     3816. ( 3)     4409. ( 3)     2763. ( 3)      856. ( 3)
 11/ 6/73   1600-1800     6710. ( 6)     5756. ( 6)     4012. ( 6)     1051. ( 6)
 11/ 6/73   1800-2000     7300. ( 6)     6149. ( 6)     5820. ( 6)     1510. ( 6)
 11/ 6/73   2000-2200     6508. ( 6)     4501. ( 6)     4436. ( 6)     1639. ( 6)
 11/ 6/73   2200-2400     3545. ( 4)     3052. ( 4)     3101. ( 4)     1325. ( 4)



 11/ 7/73   0000-0200     3070. ( 6)     2197. ( 6)     2098. ( 6)      880. ( 6)
 11/ 7/73   0200-0400     3081. ( 6)     2587. ( 6)     2423. ( 6)     1074. ( 6)
 11/ 7/73   0400-0600     3026. ( 5)     2553. ( 6)     2355. ( 6)     1138. ( 6)
 11/ 7/73   0600-0800     4920. ( 2)     3736. ( 2)     3242. ( 2)     1959. ( 2)
 11/ 7/73   0800-1000     5383. ( 5)     4080. ( 5)     3609. ( 5)     1682. ( 5)
 11/ 7/73   1000-1200     3671. ( 6)     3053. ( 6)     2759. ( 6)     1782. ( 6)
 11/ 7/73   1200-1400     2905. ( 6)     2431. ( 6)     2221. ( 6)     1667. ( 6)
 11/ 7/73   1400-1600     4057. ( 5)     3080. ( 5)     2885. ( 5)     1438. ( 5)
 11/ 7/73   1600-1800     7045. ( 6)     4797. ( 6)     4504. ( 6)     1930. ( 6)
 11/ 7/73   1800-2000     5334. ( 6)     4845. ( 6)     5106. ( 6)     3151. ( 6)
 11/ 7/73   2000-2200     6001. ( 6)     5512. ( 6)     4958. ( 6)     2645. ( 6)
 11/ 7/73   2200-2400     7028. ( 5)     6679. ( 5)     6718. ( 5)     2188. ( 5)

 DAILY AVERAGE =          4668.          3800.          3573.          1794.
  (AVG OF 2HR VALUES)


 11/ 8/73   0000-0200     5479. ( 6)     4340. ( 6)     4308. ( 6)     1468. ( 6)
 11/ 8/73   0200-0400     4953. ( 6)     4566. ( 6)     4340. ( 6)     2210. ( 6)
 11/ 8/73   0400-0600     4598. ( 6)     4017. ( 6)     3824. ( 6)     2501. ( 6)
 11/ 8/73   0600-0800     5275. ( 5)     5997. ( 5)     5275. ( 5)     4705. ( 5)
 11/ 8/73   0800-1000     6586. ( 6)     6206. ( 6)     5826. ( 6)     3388. ( 6)
 11/ 8/73   1000-1200     5987. ( 6)     5481. ( 6)     5133. ( 6)     2505. ( 6)
 11/ 8/73   1200-1400     4597. ( 6)     4123. ( 6)     3869. ( 6)     2445. ( 6)
 11/ 8/73   1400-1600    11364. ( 2)     7875. ( 2)     4585. ( 2)     1394. ( 2)
 11/ 8/73   1600-1800     8639. ( 6)     5682. ( 6)     5117. ( 6)     1861. ( 6)
 11/ 8/73   1800-2000     5549. ( 6)     4951. ( 6)     5084. ( 6)     2559. ( 6)
 11/ 8/73   2000-2200     5316. ( 6)     5449. ( 6)     5217. ( 6)     2525. ( 6)
 11/ 8/73   2200-2400     5226. ( 5)     5303. ( 5)     4994. ( 5)     2205. ( 5)

 DAILY AVERAGE =          6131.          5332.          4793.          2530.
  (AVG OF 2HR VALUES)
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HOUSE  1   FALL-WINTER     CO AVERAGE CONCENTRATIONS ,UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
      MAX.: 6 PER 2HR,72 PER DAY

                                                        STATION
  DATE          TIME                1                1A              2                 4
                                OVER STOVE 1M FROM STOVE LIV/   RM     OUTSIDE

 11/ 9/73  0000-0200          4718. ( 6)  3641. ( 6)  3609. ( 6)  1221. ( 6)
 11/ 9/73  0200-0400          4055. ( 6)  3603. ( 6)  3538. ( 6)  1151. ( 6)
 11/ 9/73  0400-0600          3243. ( 6)  2662. ( 6)  2533. ( 6)  1146. ( 6)
 11/ 9/73  0600-0800          2815. ( 5)  2424. ( 5)  2183. ( 5)  1134. ( 5)
 11/ 9/73  0800-1000          3714. ( 5)  3323. ( 5)  2854. ( 5)  1251. ( 5)
 11/ 9/73  1000-1200          2109. ( 1)  1918. ( 1)  1726. ( 1)  1342. ( 1)
 11/ 9/73  1200-1400          3068. ( 6)  4091. ( 6)  2493. ( 6)   895. ( 6)
 11/ 9/73  1400-1600          2693. ( 5)  2693. ( 5)  2067. ( 5)  1012. ( 5)
 11/ 9/73  1600-1800          3863. ( 6)  3147. ( 6)  2951. ( 6)  1680. ( 6)
 11/ 9/73  1800-2000          3300. ( 6)  2518. ( 6)  2583. ( 6)  1345. ( 6)
 11/ 9/73  2000-2200          3029. ( 6)  2769. ( 6)  2769. ( 6)  1302. ( 6)
 11/ 9/73  2200-2400          2305. ( 5)  1640. ( 5)  1640. ( 5)   937. ( 5)

DAILY AVERAGE =               3243.       2869.       2579.       1201.
 (AVG OF 2HR VALUES)


 11/10/73  0000-0200          2378. ( 6)  1428. ( 6)  1330. ( 6)   907. ( 6)
 11/10/73  0200-0400          2335. ( 6)  1651. ( 6)  1553. ( 6)  1064. ( 6)
 11/10/73  0400-0600          2265. ( 6)  1515. ( 6)  1418. ( 6)   962. ( 6)
 11/10/73  0600-0800          2091. ( 5)  1587. ( 5)  1394. ( 5)  1045. ( 5)
 11/10/73  0800-1000          3114. ( 6)  2920. ( 6)  1984. ( 6)   887. ( 6)
 11/10/73  1000-1200          2985. ( 6)  1952. ( 6)  1888. ( 6)   952. ( 6)
 11/10/73  1200-1400          2597. ( 6)  1952. ( 6)  1985. ( 6)  1210. ( 6)
 11/10/73  1400-1600          2187. ( 5)  1568. ( 5)  1645. ( 5)   910. ( 5)
 11/10/73  1600-1800          1920. ( 6)  1307. ( 6)  1242. ( 6)  1049. ( 6)
 11/10/73  1800-2000          2727. ( 6)  2243. ( 6)  2146. ( 6)  1113. ( 6)
 11/10/73  2000-2200          3388. ( 6)  3178. ( 6)  3307. ( 6)  1339. ( 6)
 11/10/73  2200-2400          4274. ( 5)  3712. ( 4)  3664. ( 4)  2203. ( 5)

DAILY AVERAGE =               2730.       2034.       1963.       1137.
 (AVG OF 2HR VALUES)


 11/11/73  0000-0200          4469. ( 6)  3894. ( 6 )  3779. ( 6)  2858. ( 6 )
 11/11/73  0200-0400          4520. ( 3)  4073. ( 3)  3945. ( 3)  3370. ( 3)
 11/11/73  0400-0600            ******      ******      ******      ******
 11/11/73  0600-0800            ******      ******      ******      ******
 11/11/73  0800-1000            ******      ******      ******      ******
 11/11/73  1000-1200            ******      ******      ******      ******
 11/11/73  1200-1400            ******      ******      ******      ******
 11/11/73  1400-1600          7929. ( 4)  7687. ( 4)  6428. ( 4)  2749. ( 4)
 11/11/73  1600-1800          9483. ( 6)  7354. ( 6)  7096. ( 6)  3321. ( 6)
 11/11/73  1800-2000          6828. ( 6)  6183. ( 6)  6377. ( 6)  3634. ( 6)
 11/11/73  2000-2200          7541. ( 4)  7105. ( 4)  7396. ( 4)  5992. ( 4)
 11/11/73  2200-2400            ******      ******      ******      ******
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HOUSE  1   FALL-WINTER    CO AVERAGE CONCENTRATIONS ,UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                      STATION
  DATE        TIME           1                1A               2              4
                         OVER STOVE 1M FROM STOVE LIV/   RM    OUTSIDE

11/12/73  0000-0200       ******          ******          ******          ******
11/12/73  0200-0400       ******          ******          ******          ******
11/12/73  0400-0600       ******          ******          ******          ******
11/12/73  0600-0800       ******          ******          ******          ******
11/12/73  0800-1000       ******          ******          ******          ******
11/12/73  1000-1200       ******          ******          ******          ******
11/12/73  1200-1400       ******          ******          ******          ******
11/12/73  1400-1600       ******          ******          ******          ******
11/12/73  1600-1800       ******          ******          ******          ******
11/12/73  1800-2000     7058. ( 6)     6193. ( 6)     6055. ( 6)     3667. ( 6)
11/12/73  2000-2200     6331. ( 6)     5847. ( 6)     5950. ( 6)     3806. ( 6)
11/12/73  2200-2400     6638. ( 5)     6223. ( 5)     6223. ( 5)     3234. ( 5)



11/13/73  0000-0200     4430. ( 6)     3973. ( 6)     4014. ( 6 )    3309. ( 6)
11/13/73  0200-0400     5827. ( 6)     5411. ( 6)     5308. ( 6)     3128. ( 6)
11/13/73  0400-0600     5717. ( 3)     5163. ( 3)     5094. ( 3)     3295. ( 3)
11/13/73  0600-0800       ******          ******          ******          ******
11/13/73  0800-1000     5393. ( 4)     4828. ( 4)     4674. ( 4)     2620. ( 4)
11/13/73  1000-1200     4572. ( 6)     4024. ( 6)     3989. ( 6)     2517. ( 6)
11/13/73  1200-1400     4332. ( 6)     3989. ( 6)     3852. ( 6)     3030. ( 6)
11/13/73  1400-1600     7732. ( 3)     7115. ( 3)     7184. ( 3)     4718. ( 3)
11/13/73  1600-1800     9141. ( 5)     7783. ( 6)     7578. ( 6)     5010. ( 6)
11/13/73  1800-2000     7058. ( 5)     6518. ( 5)     6642. ( 5)     3072. ( 5)
11/13/73  2000-2200     6227. ( 3)     5674. ( 3)     5674. ( 3)     2491. ( 3)
11/13/73  2200-2400       ******          ******          ******          ******



11/14/73  0000-0200       ******          ******          ******          ******
11/14/73  0200-0400       ******          ******          ******          ******
11/14/73  0400-0600       ******          ******          ******          ******
11/14/73  0600-0800       ******          ******          ******          ******
11/14/73  0800-1000       ******          ******          ******          ******
11/14/73  1000-1200     4859. ( 6)     4369. ( 6)     4439. ( 6)     2028. ( 6)
11/14/73  1200-1400     3880. ( 6)     3251. ( 6)     3006. ( 6)     1258. ( 6)
11/14/73  1400-1600     2849. ( 5)     2346. ( 5)     2136. ( 5)     1423. ( 5)
11/14/73  1600-1800     3692. ( 6)     3308. ( 6)     3133. ( 6)     2868. ( 6)
11/14/73  1800-2000     5150. ( 6)     4696. ( 6)     4800. ( 6)     2878. ( 6)
11/14/73  2000-2200     6468. ( 6)     6013. ( 6)     6118. ( 6)     4930. ( 6)
11/14/73  2200-2400     7052. ( 5)     6637. ( 5)     6637. ( 5)     3897. ( 5)
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HOUSE  1   FALL-WINTER    CO AVERAGE CONCENTRATIONS ,UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                   STATION
  DATE          TIME              1              1A             3              4
                            OVER STOVE 1M FROM STOVE      /BD RM       OUTSIDE


11/15/73  0000-0200        6030. ( 6)  4714. ( 6)  4714. ( 6)  2984. ( 6)
11/15/73  0200-0400        5793. ( 6)  5447. ( 6)  5378. ( 6)  3440. ( 6)
11/15/73  0400-0600        5663. ( 6)  5178. ( 6)  5074. ( 6)  3276. ( 6)
11/15/73  0600-0800        5210. ( 5)  4712. ( 5)  4795. ( 5)  3342. ( 5)
11/15/73  0800-1000        6348. ( 6)  6175. ( 6)  5933. ( 6)  3892. ( 6)
11/15/73  1000-1200        6106. ( 6)  5899. ( 6)  5587. ( 6)  2647. ( 6)
11/15/73  1200-1400        4965. ( 6)  3788. ( 6)  3961. ( 6)  2301. ( 6)
11/15/73  1400-1600        4273. ( 5)  3630. ( 5)  3194. ( 5)  2737. ( 5)
11/15/73  1600-1800        4208. ( 6)  3966. ( 6)  3170. ( 6)  2582. ( 6)
11/15/73  1800-2000        4612. ( 6)  4267. ( 6)  3851. ( 6)  2295. ( 6)
11/15/73  2000-2200        4914. ( 6)  4395. ( 6)  4152. ( 6)  2111. ( 6)
11/15/73  2200-2400        5127. ( 5)  4534. ( 5)  3347. ( 5)  1821. ( 5)

DAILY AVERAGE =            5271.       4727.       4430.       2786.
 (AVG OF 2HR VALUES)



11/16/73  0000-0200        4311. ( 6)  3522. ( 6)  2144. ( 6)  1473. ( 6)
11/16/73  0200-0400        4217. ( 6)  4217. ( 6)  2804. ( 6)  1956. ( 6)
11/16/73  0400-0600        4348. ( 6)  4206. ( 6)  3146. ( 6)  2158. ( 6)
11/16/73  0600-0800        4648. ( 5)  4262. ( 5)  2892. ( 5)  2163. ( 5)
11/16/73  0800-1000        4373. ( 6)  4123. ( 6)  3981. ( 6)  1732. ( 6)
11/16/73  1000-1200        3552. ( 6)  3231. ( 6)  3124. ( 6)  1732. ( 6)
11/16/73  1200-1400        3083. ( 6)  2517. ( 6)  2517. ( 6)  1553. ( 6)
11/16/73  1400-1600        2389. ( 5)  1923. ( 5)  1711. ( 5)  1245. ( 5)
11/16/73  1600-1800        3419. ( 6)  2607. ( 6)  1794. ( 6)  1253. ( 5)
11/16/73  1800-2000        4636. ( 6)  4530. ( 6)  3364. ( 6)  1104. ( 6)
11/16/73  2000-2200        4863. ( 6)  4122. ( 6)  4051. ( 6)  1084. ( 6)
11/16/73  2200-2400        3221. ( 6)  2457. ( 6)  2669. ( 6)  1271. ( 6)

DAILY AVERAGE =            3922.       3476.       2850.       1560.
 (AVG OF 2HR VALUES)



11/17/73  0000-0200        2921. ( 6)  1959. ( 6)  2080. ( 6)  1323. ( 6 )
11/17/73  0200-0400        2603. ( 6)  1932. ( 6)  1932. ( 6)  1190. ( 6)
11/17/73  0400-0600        2633. ( 6)  1926. ( 6)  1891. ( 6)  1291. ( 6)
11/17/73  0600-0800        2538. ( 5)  2119. ( 5)  1909. ( 5)  1405. ( 5)
11/17/73  0800-1000        2989. ( 6)  2639. ( 6)  2814. ( 6)  1311. ( 6)
11/17/73  1000-1200        5051. ( 6)  3968. ( 6)  2570. ( 6)  2045. ( 6)
11/17/73  1200-1400        3443. ( 6)  2849. ( 6)  2370. ( 5)  1136. ( 6)
11/17/73  1400-1600        2326. ( 5)  1734. ( 5)  1776. ( 5)  1394. ( 5)
11/17/73  1600-1800        5420. ( 6)  4714. ( 6)  3053. ( 6)  1747. ( 6)
11/17/73  1800-2000        4414. ( 5)  3948. ( 5)  3777. ( 4)  2337. ( 5)
11/17/73  2000-2200        5600. ( 6)  5247. ( 6)  4682. ( 6)  2068. ( 6)
11/17/73  2200-2400        5072. ( 5)  4695. ( 5)  4695. ( 5)  1381. ( 5)

DAILY AVERAGE =            3751.       3144.       2796.       1552.
 (AVG OF 2HR VALUES)
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HOUSE  1   FALL-WINTER    CO AVERAGE CONCENTRATIONS ,UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                          STATION
   DATE         TIME             1                 1A                 3              4
                           OVER STOVE 1M FROM STOVE      /BD RM        OUTSIDE


 11/18/73   0000-0200     4176. ( 6)  3060. ( 6)   3025. ( 6)   1173. ( 6)
 11/18/73   0200-0400     3568. ( 6)  3113. ( 6)   2974. ( 6)   1540. ( 6)
 11/18/73   0400-0600     3272. ( 6)  2608. ( 6)   2538. ( 6)   1455. ( 6)
 11/18/73   0600-0800     2538. ( 5)  2039. ( 5)   1902. ( 5)   1097. ( 5)
 11/18/73   0800-1000     4401. ( 6)  3482. ( 6)   2317. ( 6)   1292. ( 6)
 11/18/73   1000-1200     3860. ( 6)  3154. ( 6)   2412. ( 6)   1423. ( 6)
 11/18/73   1200-1400     3496. ( 6)  3002. ( 6)   2437. ( 6)   1412. ( 6)
 11/18/73   1400-1600     3973. ( 5)  4016. ( 5)   3083. ( 5)   1727. ( 5)
 11/18/73   1600-1800     4581. ( 6)  4037. ( 6)   4016. ( 6)   2815. ( 6)
 11/18/73   1800-2000     5745. ( 6)  5074. ( 6)   5074. ( 6)   3237. ( 6)
 11/18/73   2000-2200     5814. ( 6)  5284. ( 6)   4931. ( 6)   3059. ( 6)
 11/18/73   2200-2400     4197. ( 6)  3688. ( 6)   3900. ( 6)   1781. ( 6)

DAILY AVERAGE =           4135.       3550.        3217.        1834.
 (AVG OF 2HR VALUES)



 11/19/73   0000-0200     3434. ( 6)  3073. ( 6)   3109. ( 6)   1837. ( 6)
 11/19/73   0200-0400     4239. ( 6)  3638. ( 6)   3603. ( 6)   2649. ( 6)
 11/19/73   0400-0600     4345. ( 6)  3638. ( 6)   3638. ( 6)   2628. ( 5)
 11/19/73   0600-0800     4745. ( 5)  4406. ( 5)   3854. ( 5)   2922. ( 5)
 11/19/73   0800-1000     5467. ( 6)  4690. ( 6)   4372. ( 6)   2394. ( 6)
 11/19/73   1000-1200     3695. ( 6)  3236. ( 6)   3272. ( 6)   1766. ( 5)
 11/19/73   1200-1400     5460. ( 5)  4894. ( 5)   4671. ( 5)   1866. ( 4)
 11/19/73   1400-1600     7293. ( 4)  5370. ( 4)   3504. ( 4)   2429. ( 4)
 11/19/73   1600-1800     6963. ( 6)  5606. ( 6)   4965. ( 6)   1873. ( 6)
 11/19/73   1800-2000     5331. ( 6)  4690. ( 6)   4992. ( 6)   2163. ( 6)
 11/19/73   2000-2200     5282. ( 6)  4641. ( 6)   4603. ( 6)   3095. ( 6)
 11/19/73   2200-2400     4734. ( 6)  4376. ( 6)   4466. ( 6)   2855. ( 6)

DAILY AVERAGE =           5082.       4355.        4087.        2373.
 (AVG OF 2HR VALUES)



 11/20/73   0000-0200     5076. ( 6)  3820. ( 6)   3894. ( 6)   2104. ( 6)
 11/20/73   0200-0400     4695. ( 6)  4173. ( 6)   4210. ( 6)   2122. ( 6)
 11/20/73   0400-0600     4156. ( 6)  3559. ( 6)   3746. ( 6)   2068. ( 6)
 11/20/73   0600-0800     4640. ( 5)  4377. ( 5)   3589. ( 5)   4640. ( 5)
 11/20/73   0800-1000     6420. ( 6)  6019. ( 6)   5180. ( 6)   2626. ( 6)
 11/20/73   1000-1200     4596. ( 6)  3830. ( 6)   4085. ( 6)   1642. ( 6)
 11/20/73   1200-1400     5508. ( 6)  4414. ( 6)   4231. ( 6)   1605. ( 6)
 11/20/73   1400-1600     3751. ( 5)  3176. ( 5)   3796. ( 5)   1627. ( 5)
 11/20/73   1600-1800     5994. ( 6)  5625. ( 6)   4187. ( 6)   4703. ( 6)
 11/20/73   1800-2000     9263. ( 6)  9152. ( 6)   8304. ( 6)   9005. ( 6)
 11/20/73   2000-2200    10504. ( 6)  9803. ( 6)   9951. ( 6)   3033. ( 6)
 11/20/73   2200-2400    13970. ( 6) 14147. ( 6)  12112. ( 6)   4987. ( 6)

DAILY AVERAGE =           6548.       6008.        5607.        3763.
 (AVG OF 2HR VALUES)
```

Appendix B-3

NO_2, NO, and CO data for House No. 2 - Spring/Summer

```
HØUSE  2  SPRING-SUMMER        NØ2 AVERAGE CONCENTRATIØNS , UG/M3
   VALUES IN ( ) ARE NØ. ØF ØBSERVATIØNS IN PERIØD
      MAX.: 6 PER 2HR,72 PER DAY

                                                  STATIØN
   DATE          TIME              1                2                3              4
                               ØVER STØVE        Liv Rm           BD RM         ØUTSIDE

  5/29/73    0000-0200          ******           ******           ******         ******
  5/29/73    0200-0400          ******           ******           ******         ******
  5/29/73    0400-0600          ******           ******           ******         ******
  5/29/73    0600-0800          ******           ******           ******         ******
  5/29/73    0800-1000          ******           ******           ******         ******
  5/29/73    1000-1200          ******           ******           ******         ******
  5/29/73    1200-1400          ******           ******           ******         ******
  5/29/73    1400-1600          ******           ******           ******         ******
  5/29/73    1600-1800       167.0 ( 4)       93.5 ( 4)       68.7 ( 4)       79.2 ( 4)
  5/29/73    1800-2000        54.7 ( 6)       54.1 ( 6)       47.1 ( 6)       42.6 ( 6)
  5/29/73    2000-2200        96.1 ( 6)       94.8 ( 6)       87.8 ( 6)       97.4 ( 6)
  5/29/73    2200-2400        66.2 ( 6)       63.7 ( 6)       78.9 ( 6)       80.2 ( 6)



  5/30/73    0000-0200        60.5 ( 6)       66.2 ( 6)       61.1 ( 6)       74.5 ( 6)
  5/30/73    0200-0400        56.6 ( 6)       55.4 ( 6)       57.3 ( 6)       64.9 ( 6)
  5/30/73    0400-0600        42.0 ( 6)       42.0 ( 6)       42.6 ( 6)       44.5 ( 6)
  5/30/73    0600-0800        95.4 ( 6)       52.2 ( 6)       63.0 ( 6)       57.3 ( 6)
  5/30/73    0800-1000        84.0 ( 6)       85.9 ( 6)       97.4 ( 6)       80.8 ( 6)
  5/30/73    1000-1200        66.8 ( 6)       60.5 ( 6)       45.8 ( 6)       42.0 ( 6)
  5/30/73    1200-1400       126.0 ( 5)       57.3 ( 5)       37.4 ( 5)       29.8 ( 5)
  5/30/73    1400-1600        51.9 ( 5)       51.2 ( 5)       43.5 ( 5)       31.3 ( 5)
  5/30/73    1600-1800       163.2 ( 6)       87.2 ( 6)       90.4 ( 6)       44.5 ( 6)
  5/30/73    1800-2000        53.5 ( 6)       56.0 ( 6)       54.1 ( 6)       50.3 ( 6)
  5/30/73    2000-2200        78.9 ( 6)       76.4 ( 6)       78.3 ( 6)       70.6 ( 6)
  5/30/73    2200-2400        75.7 ( 6)       70.0 ( 6)       73.2 ( 6)       70.6 ( 6)

DAILY AVERAGE =               79.5            63.3            62.0            55.1
 (AVG ØF 2HR VALUES)


  5/31/73    0000-0200        61.1 ( 6)       58.5 ( 6)       56.5 ( 6)       55.4 ( 6)
  5/31/73    0200-0400        62.4 ( 6)       52.8 ( 6)       56.0 ( 6)       65.5 ( 6)
  5/31/73    0400-0600        48.4 ( 6)       45.8 ( 6)       45.2 ( 6)       39.5 ( 6)
  5/31/73    0600-0800       100.5 ( 6)       66.2 ( 6)       54.1 ( 6)       49.6 ( 6)
  5/31/73    0800-1000        69.4 ( 6)       67.5 ( 6)       65.5 ( 6)       57.9 ( 6)
  5/31/73    1000-1200        56.0 ( 6)       59.2 ( 6)       53.5 ( 6)       47.7 ( 6)
  5/31/73    1200-1400        47.7 ( 6)       52.8 ( 6)       50.3 ( 6)       46.5 ( 6)
  5/31/73    1400-1600        49.0 ( 6)       54.1 ( 6)       48.4 ( 6)       40.1 ( 6)
  5/31/73    1600-1800        46.5 ( 6)       51.5 ( 6)       47.1 ( 6)       42.6 ( 6)
  5/31/73    1800-2000        61.1 ( 6)       58.5 ( 6)       56.6 ( 6)       57.3 ( 6)
  5/31/73    2000-2200       175.9 ( 6)       93.5 ( 6)       91.0 ( 6)       92.9 ( 6)
  5/31/73    2200-2400        70.6 ( 6)       62.4 ( 6)       70.0 ( 6)       84.0 ( 6)

DAILY AVERAGE =               70.7            60.2            57.9            56.6
 (AVG ØF 2HR VALUES)
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```
HOUSE  2  SPRING-SUMMER        NO2 AVERAGE CONCENTRATIONS , UG/M3
   VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
      MAX.: 6 PER 2HR,72 PER DAY

                                                   STATION
   DATE         TIME             1            2              3             4
                             OVER STOVE     LIV Rm         /BD RM        OUTSIDE

  6/ 1/73   0000-0200        80.2 ( 6)    71.9 ( 6)     66.2 ( 6)     66.2 ( 6)
  6/ 1/73   0200-0400        55.4 ( 6)    57.3 ( 6)     50.9 ( 6)     48.4 ( 6)
  6/ 1/73   0400-0600        43.9 ( 6)    40.1 ( 6)     38.2 ( 6)     38.2 ( 6)
  6/ 1/73   0600-0800        93.2 ( 5)    58.0 ( 5)     58.8 ( 5)     58.8 ( 5)
  6/ 1/73   0800-1000         ******       ******        ******        ******
  6/ 1/73   1000-1200         ******       ******        ******        ******
  6/ 1/73   1200-1400         ******       ******        ******        ******
  6/ 1/73   1400-1600       123.7 ( 5)   110.7 ( 5)    106.1 ( 5)    107.7 ( 5)
  6/ 1/73   1600-1800       124.1 ( 6)   121.5 ( 6)    126.6 ( 6)    123.4 ( 6)
  6/ 1/73   1800-2000       157.8 ( 6)   153.7 ( 6)    165.4 ( 6)    164.2 ( 6)
  6/ 1/73   2000-2200       152.1 ( 6)   152.1 ( 6)    155.3 ( 6)    150.2 ( 6)
  6/ 1/73   2200-2400       155.3 ( 6)   142.5 ( 6)    150.8 ( 6)    153.4 ( 6)




  6/ 2/73   0000-0200       139.4 ( 6)   145.1 ( 6)    138.1 ( 6)    133.6 ( 6)
  6/ 2/73   0200-0400       112.6 ( 6)   113.3 ( 6)    108.8 ( 6)    107.5 ( 6)
  6/ 2/73   0400-0600        99.9 ( 6)   108.2 ( 6)    105.6 ( 6)     94.2 ( 6)
  6/ 2/73   0600-0800       105.6 ( 6)   110.1 ( 6)    106.3 ( 6)    102.4 ( 6)
  6/ 2/73   0800-1000       100.5 ( 6)   109.4 ( 6)    105.6 ( 6)    102.4 ( 6)
  6/ 2/73   1000-1200       108.2 ( 6)   112.6 ( 6)    110.7 ( 6)    113.3 ( 6)
  6/ 2/73   1200-1400       277.8 ( 6)   142.5 ( 6)    139.4 ( 6)    116.4 ( 6)
  6/ 2/73   1400-1600       110.1 ( 6)   108.8 ( 6)    111.4 ( 6)    105.0 ( 6)
  6/ 2/73   1600-1800       108.2 ( 6)   110.1 ( 6)    115.2 ( 6)    105.6 ( 6)
  6/ 2/73   1800-2000       120.3 ( 6)   129.2 ( 6)    129.8 ( 6)    133.0 ( 6)
  6/ 2/73   2000-2200       163.5 ( 6)   160.4 ( 6)    156.5 ( 6)    164.2 ( 6)
  6/ 2/73   2200-2400       152.1 ( 6)   145.1 ( 6)    143.8 ( 6)    152.1 ( 6)

 DAILY AVERAGE =            133.2        124.6         122.6         119.2
  (AVG OF 2HR VALUES)


  6/ 3/73   0000-0200       126.0 ( 6)   124.7 ( 6)    122.8 ( 6)    135.5 ( 6)
  6/ 3/73   0200-0400       123.4 ( 6)   120.3 ( 6)    119.6 ( 6)    128.5 ( 6)
  6/ 3/73   0400-0600       122.8 ( 6)   124.7 ( 6)    127.3 ( 6)    124.1 ( 6)
  6/ 3/73   0600-0800       117.1 ( 6)   120.9 ( 6)    120.3 ( 6)    117.1 ( 6)
  6/ 3/73   0800-1000       141.9 ( 6)   125.4 ( 6)    129.2 ( 6)    114.5 ( 6)
  6/ 3/73   1000-1200       110.1 ( 6)   116.4 ( 6)    119.0 ( 6)    116.4 ( 6)
  6/ 3/73   1200-1400       111.4 ( 6)   114.5 ( 6)    114.5 ( 6)    107.5 ( 6)
  6/ 3/73   1400-1600       110.1 ( 6)   112.0 ( 6)    106.3 ( 6)    102.4 ( 6)
  6/ 3/73   1600-1800       115.8 ( 6)   117.7 ( 6)    115.2 ( 6)    113.3 ( 6)
  6/ 3/73   1800-2000       117.7 ( 6)   123.4 ( 6)    121.5 ( 6)    119.0 ( 6)
  6/ 3/73   2000-2200       171.2 ( 6)   153.4 ( 6)    156.5 ( 6)    145.7 ( 6)
  6/ 3/73   2200-2400       158.4 ( 6)   148.9 ( 6)    138.1 ( 6)    154.0 ( 6)

 DAILY AVERAGE =            127.2        125.2         124.2         123.2
  (AVG OF 2HR VALUES)
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HOUSE  2  SPRING-SUMMER        NO2 AVERAGE CONCENTRATIONS , UG/M3
   VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
       MAX.: 6 PER 2HR,72 PER DAY

                                                          STATION
   DATE         TIME              1               2                3                4
                              OVER STOVE        Liv Rm          /3D RM          OUTSIDE

  6/ 4/73   0000-0200      145.7 ( 6)     140.0 ( 6)     140.6 ( 6)     138.7 ( 6)
  6/ 4/73   0200-0400      129.2 ( 6)     125.4 ( 6)     128.5 ( 6)     131.1 ( 6)
  6/ 4/73   0400-0600      112.0 ( 6)     117.1 ( 6)     125.4 ( 6)     126.0 ( 6)
  6/ 4/73   0600-0800      140.6 ( 6)     126.0 ( 6)     131.1 ( 6)     126.6 ( 6)
  6/ 4/73   0800-1000      139.4 ( 6)     124.1 ( 6)     133.6 ( 6)     143.2 ( 6)
  6/ 4/73   1000-1200      146.4 ( 6)     133.0 ( 6)     136.8 ( 6)     138.7 ( 6)
  6/ 4/73   1200-1400      190.9 ( 6)     162.9 ( 6)     152.7 ( 6)     139.4 ( 6)
  6/ 4/73   1400-1600      139.4 ( 6)     143.8 ( 6)     141.3 ( 6)     138.1 ( 6)
  6/ 4/73   1600-1800      147.0 ( 6)     141.3 ( 6)     154.6 ( 6)     161.0 ( 6)
  6/ 4/73   1800-2000      166.7 ( 6)     157.8 ( 6)     161.0 ( 6)     174.4 ( 6)
  6/ 4/73   2000-2200      178.2 ( 6)     177.5 ( 6)     173.1 ( 6)     183.3 ( 6)
  6/ 4/73   2200-2400      192.8 ( 6)     183.3 ( 6)     182.6 ( 6)     226.5 ( 6)

DAILY AVERAGE =            152.3          144.3          146.8          152.2
 (AVG OF 2HR VALUES)


  6/ 5/73   0000-0200      168.6 ( 6)     163.6 ( 6)     168.6 ( 6)     161.6 ( 6)
  6/ 5/73   0200-0400      117.1 ( 6)     124.7 ( 6)     125.4 ( 6)     112.6 ( 6)
  6/ 5/73   0400-0600      117.7 ( 6)     115.8 ( 6)     117.1 ( 6)     115.2 ( 6)
  6/ 5/73   0600-0800      124.7 ( 6)     122.8 ( 6)     129.2 ( 6)     127.9 ( 6)
  6/ 5/73   0800-1000      122.2 ( 1)     126.0 ( 1)     122.2 ( 1)     137.4 ( 1)
  6/ 5/73   1000-1200        ******         ******         ******         ******
  6/ 5/73   1200-1400        ******         ******         ******         ******
  6/ 5/73   1400-1600        ******         ******         ******         ******
  6/ 5/73   1600-1800        ******         ******         ******         ******
  6/ 5/73   1800-2000        ******         ******         ******         ******
  6/ 5/73   2000-2200        ******         ******         ******         ******
  6/ 5/73   2200-2400       57.3 ( 4)      60.1 ( 4)      62.0 ( 4)      44.9 ( 4)



  6/ 6/73   0000-0200       49.6 ( 1)      53.5 ( 1)      53.5 ( 1)      42.0 ( 1)
  6/ 6/73   0200-0400        ******         ******         ******         ******
  6/ 6/73   0400-0600        ******         ******         ******         ******
  6/ 6/73   0600-0800       33.1 ( 3)      38.2 ( 3)      38.2 ( 3)      54.7 ( 3)
  6/ 6/73   0800-1000      110.1 ( 6)      58.5 ( 6)      57.3 ( 6)      38.5 ( 6)
  6/ 6/73   1000-1200       36.3 ( 6)      45.8 ( 6)      45.8 ( 6)      35.6 ( 6)
  6/ 6/73   1200-1400       90.4 ( 3)      59.8 ( 3)      61.1 ( 3)      48.4 ( 3)
  6/ 6/73   1400-1600        ******         ******         ******         ******
  6/ 6/73   1600-1800        ******         ******         ******         ******
  6/ 6/73   1800-2000        ******         ******         ******         ******
  6/ 6/73   2000-2200        ******         ******         ******         ******
  6/ 6/73   2200-2400        ******         ******         ******         ******
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HOUSE  2  SPRING-SUMMER   NO     AVERAGE CONCENTRATIONS , UG/M3
   VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
       MAX.: 6 PER 2HR,72 PER DAY

                                                    STATION
   DATE          TIME               1                2                3               4
                               OVER STOVE         Liv Rm           /BD RM         OUTSIDE

    5/29/73   0000-0200          ******           ******           ******          ******
    5/29/73   0200-0400          ******           ******           ******          ******
    5/29/73   0400-0600          ******           ******           ******          ******
    5/29/73   0600-0800          ******           ******           ******          ******
    5/29/73   0800-1000          ******           ******           ******          ******
    5/29/73   1000-1200          ******           ******           ******          ******
    5/29/73   1200-1400          ******           ******           ******          ******
    5/29/73   1400-1600          ******           ******           ******          ******
    5/29/73   1600-1800        81.1 ( 3)       13.8 ( 4)       17.6 ( 4)       13.4 ( 3)
    5/29/73   1800-2000         2.5 ( 2)        3.8 ( 2)        3.8 ( 4)        6.3 ( 4)
    5/29/73   2000-2200        53.9 ( 6)       47.7 ( 6)       43.1 ( 6)       42.2 ( 6)
    5/29/73   2200-2400       120.8 ( 6)      117.0 ( 6)      113.3 ( 6)      117.0 ( 6)



    5/30/73   0000-0200       113.7 ( 6)      109.5 ( 6)      107.4 ( 6)      100.3 ( 5)
    5/30/73   0200-0400        89.9 ( 6)       89.0 ( 6)       86.5 ( 6)       69.0 ( 6)
    5/30/73   0400-0600        80.7 ( 6)       78.6 ( 6)       76.9 ( 6)       78.6 ( 6)
    5/30/73   0600-0800       151.7 ( 6)      111.2 ( 6)      104.5 ( 6)       83.2 ( 6)
    5/30/73   0800-1000       101.2 ( 6)      100.7 ( 6)       88.2 ( 6)       64.0 ( 6)
    5/30/73   1000-1200         7.5 ( 6)        7.1 ( 6)        5.9 ( 6)        8.8 ( 6)
    5/30/73   1200-1400        94.3 ( 5)       10.0 ( 5)        5.5 ( 5)        6.5 ( 5)
    5/30/73   1400-1600         4.0 ( 5)        4.4 ( 4)        5.0 ( 1)        2.5 ( 2)
    5/30/73   1600-1800       109.3 ( 5)       14.6 ( 6)       18.0 ( 6)        3.8 ( 4)
    5/30/73   1800-2000         4.4 ( 4)        4.2 ( 3)        3.8 ( 2)        2.9 ( 6)
    5/30/73   2000-2200         9.2 ( 6)        3.8 ( 6)        5.9 ( 6)        7.9 ( 6)
    5/30/73   2200-2400        13.8 ( 6)        7.9 ( 6)        8.4 ( 6)        4.2 ( 6)

 DAILY AVERAGE =               65.0            45.5            43.0            36.0
  (AVG OF 2HR VALUES)


    5/31/73   0000-0200        13.4 ( 6)        7.5 ( 6)        4.2 ( 6)        2.5 ( 5)
    5/31/73   0200-0400        18.0 ( 6)       10.9 ( 6)        3.5 ( 5)        3.1 ( 4)
    5/31/73   0400-0600        15.0 ( 6)        3.8 ( 6)        3.1 ( 4)        2.5 ( 1)
    5/31/73   0600-0800        78.4 ( 6)       18.8 ( 6)       16.3 ( 6)        7.1 ( 6)
    5/31/73   0800-1000        27.2 ( 6)       23.0 ( 6)       21.3 ( 6)       12.1 ( 6)
    5/31/73   1000-1200        10.4 ( 6)        7.9 ( 6)        5.0 ( 6)        4.6 ( 6)
    5/31/73   1200-1400         6.0 ( 5)        3.8 ( 6)        3.8 ( 6)        3.0 ( 5)
    5/31/73   1400-1600         4.0 ( 5)        4.2 ( 6)        3.8 ( 6)        3.8 ( 6)
    5/31/73   1600-1800         6.7 ( 6)        4.0 ( 5)        5.0 ( 4)        6.7 ( 6)
    5/31/73   1800-2000         7.9 ( 6)        5.9 ( 6)        5.0 ( 6)       10.0 ( 6)
    5/31/73   2000-2200       101.4 ( 6)       48.1 ( 6)       46.8 ( 6)       60.6 ( 6)
    5/31/73   2200-2400        87.4 ( 6)       85.3 ( 6)       67.3 ( 6)       51.8 ( 6)

 DAILY AVERAGE =               31.3            13.0            15.4            14.0
  (AVG OF 2HR VALUES)
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HOUSE  2  SPRING-SUMMER    NO     AVERAGE CONCENTRATIONS , UG/M3
   VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
      MAX.: 6 PER 2HR,72 PER DAY

                                                STATION
   DATE        TIME             1              2                3              4
                            OVER STOVE       Liv Rm           BD RM         OUTSIDE

  6/ 1/73    0000-0200      47.2 ( 6)      43.1 ( 6)      22.2 ( 6)      10.9 ( 6)
  6/ 1/73    0200-0400      18.8 ( 6)      13.8 ( 6)       6.3 ( 6)       4.2 ( 6)
  6/ 1/73    0400-0600      13.0 ( 6)       6.3 ( 6)       2.5 ( 6)       3.8 ( 2)
  6/ 1/73    0600-0800      38.1 ( 5)      19.1 ( 5)      18.1 ( 5)      17.1 ( 5)
  6/ 1/73    0800-1000       ******         ******         ******         ******
  6/ 1/73    1000-1200       ******         ******         ******         ******
  6/ 1/73    1200-1400       ******         ******         ******         ******
  6/ 1/73    1400-1600       5.0 ( 5)       4.4 ( 4)       5.0 ( 2)       5.0 ( 5)
  6/ 1/73    1600-1800       5.9 ( 6)       5.9 ( 6)       7.1 ( 6)       6.4 ( 6)
  6/ 1/73    1800-2000      22.6 ( 6)      23.4 ( 6)      25.9 ( 6)      33.2 ( 6)
  6/ 1/73    2000-2200      15.9 ( 6)       3.8 ( 6)       8.8 ( 6)       8.8 ( 6)
  6/ 1/73    2200-2400      18.8 ( 6)      14.6 ( 6)      13.4 ( 6)      10.9 ( 6)




  6/ 2/73    0000-0200      18.4 ( 6)      12.5 ( 6)      10.4 ( 6)      10.4 ( 6)
  6/ 2/73    0200-0400       9.2 ( 6)       6.3 ( 6)       5.0 ( 6)       2.9 ( 6)
  6/ 2/73    0400-0600      10.0 ( 6)       4.6 ( 6)       5.0 ( 5)       3.3 ( 3)
  6/ 2/73    0600-0800       5.0 ( 6)       4.4 ( 4)       4.2 ( 3)       3.8 ( 4)
  6/ 2/73    0800-1000       7.1 ( 6)       4.2 ( 6)       2.5 ( 2)       5.4 ( 6)
  6/ 2/73    1000-1200       7.9 ( 6)       6.7 ( 6)       8.5 ( 5)      10.4 ( 6)
  6/ 2/73    1200-1400      74.8 ( 6)      11.7 ( 6)      12.5 ( 6)      14.6 ( 6)
  6/ 2/73    1400-1600       5.9 ( 6)       4.5 ( 5)       4.0 ( 5)       6.3 ( 6)
  6/ 2/73    1600-1800       8.8 ( 6)       7.9 ( 6)       7.9 ( 6)      10.0 ( 6)
  6/ 2/73    1800-2000      11.3 ( 6)      15.0 ( 6)      12.5 ( 6)      15.5 ( 6)
  6/ 2/73    2000-2200      91.5 ( 6)      92.8 ( 6)      94.5 ( 6)     109.1 ( 6)
  6/ 2/73    2200-2400     159.3 ( 6)     152.2 ( 6)     150.9 ( 6)     110.4 ( 6)

 DAILY AVERAGE =            34.1           26.9           26.5           25.2
  (AVG OF 2HR VALUES)


  6/ 3/73    0000-0200     108.7 ( 6)     107.4 ( 6)     108.3 ( 6)     112.4 ( 6)
  6/ 3/73    0200-0400     114.1 ( 6)     108.7 ( 6)     107.4 ( 6)      73.1 ( 6)
  6/ 3/73    0400-0600      35.1 ( 6)      31.3 ( 6)      33.9 ( 6)      19.2 ( 6)
  6/ 3/73    0600-0800      10.0 ( 6)       7.5 ( 6)       7.9 ( 6)      10.0 ( 6)
  6/ 3/73    0800-1000      53.9 ( 6)      10.4 ( 6)      18.0 ( 6)      12.5 ( 6)
  6/ 3/73    1000-1200       7.1 ( 6)       7.1 ( 6)       7.1 ( 6)       6.4 ( 6)
  6/ 3/73    1200-1400       5.9 ( 6)       6.7 ( 6)       5.4 ( 6)       7.1 ( 6)
  6/ 3/73    1400-1600       5.9 ( 6)       6.7 ( 6)       5.4 ( 6)       5.0 ( 6)
  6/ 3/73    1600-1800       7.5 ( 6)       6.3 ( 6)       6.3 ( 6)       5.4 ( 6)
  6/ 3/73    1800-2000       7.1 ( 6)       6.3 ( 6)       5.9 ( 6)       5.4 ( 6)
  6/ 3/73    2000-2200      33.9 ( 6)      20.5 ( 6)      18.4 ( 6)      15.0 ( 6)
  6/ 3/73    2200-2400      25.5 ( 6)      19.4 ( 6)      18.0 ( 6)      14.6 ( 6)

 DAILY AVERAGE =            34.6           28.1           28.5           24.0
  (AVG OF 2HR VALUES)
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HOUSE  2  SPRING-SUMMER   NO      AVERAGE CONCENTRATIONS , UG/M3
   VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
      MAX.: 6 PER 2HR,72 PER DAY

                                              STATION
  DATE          TIME             1             2              3               4
                             OVER STOVE     LIV RM          /BD RM         OUTSIDE

 6/ 4/73    0000-0200         30.1 ( 6)     16.7 ( 6)     16.3 ( 6)      10.0 ( 6)
 6/ 4/73    0200-0400         25.5 ( 6)     13.4 ( 6)     11.7 ( 6)       9.6 ( 6)
 6/ 4/73    0400-0600         21.3 ( 6)     11.7 ( 6)     11.7 ( 6)       9.2 ( 6)
 6/ 4/73    0600-0800         53.9 ( 6)     23.8 ( 6)     21.3 ( 6)      16.7 ( 6)
 6/ 4/73    0800-1000         53.5 ( 6)     45.1 ( 6)     41.0 ( 6)      37.6 ( 6)
 6/ 4/73    1000-1200         33.4 ( 6)     27.6 ( 6)     23.0 ( 6)      18.6 ( 6)
 6/ 4/73    1200-1400         78.2 ( 6)     43.1 ( 6)     18.0 ( 6)      13.4 ( 6)
 6/ 4/73    1400-1600  [illegible].2 ( 6)     15.0 ( 6)     11.3 ( 6)      12.1 ( 6)
 6/ 4/73    1600-1800         24.7 ( 6)     22.6 ( 6)     21.7 ( 6)      17.1 ( 6)
 6/ 4/73    1800-2000         40.1 ( 6)     27.6 ( 6)     26.8 ( 6)      19.6 ( 6)
 6/ 4/73    2000-2200         51.4 ( 6)     52.2 ( 6)     48.5 ( 6)      59.8 ( 6)
 6/ 4/73    2200-2400         74.4 ( 6)     72.7 ( 6)     71.1 ( 6)      45.1 ( 6)

DAILY AVERAGE =               42.1          31.0          26.3           22.4
 (AVG OF 2HR VALUES)


 6/ 5/73    0000-0200         43.9 ( 6)     39.9 ( 6)     35.9 ( 6)      19.2 ( 5)
 6/ 5/73    0200-0400         15.0 ( 6)     13.0 ( 6)      9.2 ( 5)       6.7 ( 5)
 6/ 5/73    0400-0600         16.3 ( 6)     15.0 ( 6)     12.1 ( 5)      10.0 ( 6)
 6/ 5/73    0600-0800         41.0 ( 6)     39.9 ( 6)     45.1 ( 5)      64.0 ( 6)
 6/ 5/73    0800-1000         70.2 ( 1)     70.2 ( 1)     70.2 ( 1)      77.7 ( 1)
 6/ 5/73    1000-1200          ******        ******        ******         ******
 6/ 5/73    1200-1400          ******        ******        ******         ******
 6/ 5/73    1400-1600          ******        ******        ******         ******
 6/ 5/73    1600-1800          ******        ******        ******         ******
 6/ 5/73    1800-2000          ******        ******        ******         ******
 6/ 5/73    2000-2200          ******        ******        ******         ******
 6/ 5/73    2200-2400         13.2 ( 4)     11.3 ( 4)     12.5 ( 4)       7.5 ( 4)


 6/ 6/73    0000-0200          2.5 ( 1)      5.0 ( 1)      5.0 ( 1)       5.0 ( 1)
 6/ 6/73    0200-0400          ******        ******        ******         ******
 6/ 6/73    0400-0600          ******        ******        ******         ******
 6/ 6/73    0600-0800          8.4 ( 3)      7.5 ( 3)      5.9 ( 3)      16.7 ( 3)
 6/ 6/73    0800-1000        103.5 ( 6)     23.0 ( 6)     25.1 ( 6)       6.7 ( 6)
 6/ 6/73    1000-1200         10.0 ( 6)      7.1 ( 6)      5.0 ( 6)       7.5 ( 6)
 6/ 6/73    1200-1400         98.6 ( 3)     10.0 ( 3)     10.9 ( 3)       6.7 ( 3)
 6/ 6/73    1400-1600          ******        ******        ******         ******
 6/ 6/73    1600-1800          ******        ******        ******         ******
 6/ 6/73    1800-2000          ******        ******        ******         ******
 6/ 6/73    2000-2200          ******        ******        ******         ******
 6/ 6/73    2200-2400          ******        ******        ******         ******
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HOUSE  2   SPRING-SUMMER  CO AVERAGE CONCENTRATIONS ,UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                        STATION
  DATE        TIME              1                2                 3                4
                            OVER STOVE        Liv Rm            BD RM            OUTSIDE
 5/30/73   0000-0200      3828. ( 6)     4149. ( 6)     4124. ( 6)     4025. ( 6)
 5/30/73   0200-0400      4391. ( 6)     4662. ( 6)     4588. ( 6)     4489. ( 6)
 5/30/73   0400-0600      4909. ( 6)     5032. ( 6)     5007. ( 6)     4983. ( 6)
 5/30/73   0600-0800      5871. ( 6)     5969. ( 6)     5846. ( 6)     6167. ( 6)
 5/30/73   0800-1000      4391. ( 6)     5772. ( 6)     5747. ( 6)     5081. ( 6)
 5/30/73   1000-1200      1554. ( 6)     2555. ( 6)     2565. ( 6)     2023. ( 6)
 5/30/73   1200-1400       806. ( 6)     3103. ( 6)     1034. ( 6)      661. ( 6)
 5/30/73   1400-1600       844. ( 5)      713. ( 4)      682. ( 6)      537. ( 6)
 5/30/73   1600-1800      2474. ( 6)     3777. ( 6)      351. ( 6)     4005. ( 6)
 5/30/73   1800-2000       682. ( 6)      682. ( 6)      268. ( 6)      661. ( 6)
 5/30/73   2000-2200      1820. ( 6)     1944. ( 6)     1903. ( 6)     2130. ( 6)
 5/30/73   2200-2400      3206. ( 6)     2875. ( 6)     2896. ( 6)     3227. ( 6)

DAILY AVERAGE =           2898.          3436.          2918.          3166.
 (AVG OF 2HR VALUES)


 5/31/73   0000-0200      2337. ( 6)     2358. ( 6)     1799. ( 6)     2255. ( 6)
 5/31/73   0200-0400      2358. ( 6)     2420. ( 6)     2316. ( 6)     2805. ( 6)
 5/31/73   0400-0600      2296. ( 6)     2296. ( 6)     2213. ( 6)     2482. ( 5)
 5/31/73   0600-0800      2647. ( 6)     2283. ( 6)     3640. ( 6)     2834. ( 6)
 5/31/73   0800-1000      3188. ( 6)     3234. ( 6)     3354. ( 6)     3883. ( 6)
 5/31/73   1000-1200      3073. ( 6)     2923. ( 6)     2884. ( 6)     2475. ( 6)
 5/31/73   1200-1400      2256. ( 6)     2107. ( 6)     2007. ( 6)     2135. ( 6)
 5/31/73   1400-1600      1344. ( 6)     1270. ( 6)     1045. ( 6)      896. ( 6)
 5/31/73   1600-1800       863. ( 6)      813. ( 6)      714. ( 6)      739. ( 6)
 5/31/73   1800-2000      1021. ( 6)      971. ( 6)     1071. ( 6)     1245. ( 6)
 5/31/73   2000-2200      5951. ( 6)     5164. ( 6)     5015. ( 6)     5837. ( 6)
 5/31/73   2200-2400      4409. ( 6)     4234. ( 6)     4210. ( 6)     3014. ( 6)

DAILY AVERAGE =           2645.          2506.          2522.          2550.
 (AVG OF 2HR VALUES)


 6/ 1/73   0000-0200      2798. ( 6)     2674. ( 6)     2450. ( 6)     1578. ( 6)
 6/ 1/73   0200-0400      2875. ( 6)     3180. ( 6)     3255. ( 6)     2956. ( 6)
 6/ 1/73   0400-0600      4194. ( 6)     4218. ( 6)     4467. ( 6)     4168. ( 6)
 6/ 1/73   0600-0800      5746. ( 6)     5238. ( 6)     5348. ( 6)     5099. ( 6)
 6/ 1/73   0800-1000      4908. ( 6)     4794. ( 6)     4559. ( 6)     4236. ( 6)
 6/ 1/73   1000-1200      4053. ( 6)     3356. ( 6)     3231. ( 6)     3032. ( 6)
 6/ 1/73   1200-1400      2190. ( 6)     3037. ( 6)     2140. ( 6)     2464. ( 6)
 6/ 1/73   1400-1600      1232. ( 6)     1196. ( 6)     1156. ( 6)     2464. ( 6)
 6/ 1/73   1600-1800      1081. ( 6)     1081. ( 6)     1217. ( 6)     1207. ( 6)
 6/ 1/73   1800-2000      5583. ( 6)     5759. ( 6)     5985. ( 6)     5834. ( 6)
 6/ 1/73   2000-2200        ******         ******         ******         ******
 6/ 1/73   2200-2400        ******         ******         ******         ******
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HOUSE  2   SPRING-SUMMER  CO AVERAGE CONCENTRATIONS ,UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                  STATION
 DATE         TIME            1            2                3              4
                          OVER STOVE     Liv Rm          /BD RM        OUTSIDE

 6/ 6/73   0000-0200     1767. ( 6)   1767. ( 6)   1793. ( 6)   1717. ( 6)
 6/ 6/73   0200-0400     2120. ( 6)   2120. ( 6)   2120. ( 6)   2070. ( 6)
 6/ 6/73   0400-0600     3428. ( 6)   3428. ( 6)   3454. ( 6)   3479. ( 6)
 6/ 6/73   0600-0800     4343. ( 6)   4393. ( 6)   4393. ( 6)   4520. ( 6)
 6/ 6/73   0800-1000     5702. ( 6)   4991. ( 6)   4813. ( 6)   4330. ( 6)
 6/ 6/73   1000-1200     3987. ( 6)   3835. ( 6)   3835. ( 6)   3504. ( 6)
 6/ 6/73   1200-1400     3835. ( 6)   3454. ( 6)   3250. ( 6)   3047. ( 6)
 6/ 6/73   1400-1600     2019. ( 6)   1790. ( 6)   1536. ( 6)   1434. ( 6)
 6/ 6/73   1600-1800     1625. ( 6)   1320. ( 6)   1371. ( 6)   1015. ( 6)
 6/ 6/73   1800-2000     3454. ( 6)   3479. ( 6)   3657. ( 6)   3657. ( 6)
 6/ 6/73   2000-2200     5295. ( 6)   5134. ( 6)   5244. ( 6)   5041. ( 6)
 6/ 6/73   2200-2400     3936. ( 6)   3784. ( 6)   3632. ( 6)   3327. ( 6)

DAILY AVERAGE =          3459.        3236.        3258.        3095.
 (AVG OF 2HR VALUES)


 6/ 7/73   0000-0200     1473. ( 6)   1422. ( 6)   1396. ( 6)   1346. ( 6)
 6/ 7/73   0200-0400      939. ( 6)    939. ( 6)    863. ( 6)    812. ( 6)
 6/ 7/73   0400-0600      837. ( 6)    863. ( 6)    863. ( 6)    863. ( 6)
 6/ 7/73   0600-0800       ******       ******       ******       ******
 6/ 7/73   0800-1000       ******       ******       ******       ******
 6/ 7/73   1000-1200       ******       ******       ******       ******
 6/ 7/73   1200-1400       ******       ******       ******       ******
 6/ 7/73   1400-1600       ******       ******       ******       ******
 6/ 7/73   1600-1800       ******       ******       ******       ******
 6/ 7/73   1800-2000       ******       ******       ******       ******
 6/ 7/73   2000-2200       ******       ******       ******       ******
 6/ 7/73   2200-2400       ******       ******       ******       ******
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Appendix B-4

NO_2, NO, and CO data for House No. 3 - Spring/Summer

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HOUSE  3  SPRING-SUMMER      NO2 AVERAGE CONCENTRATIONS , UG/M3
   VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
      MAX.: 6 PER 2HR,72 PER DAY

                                                         STATION
  DATE          TIME                  1               2                3               4
                                 OVER STOVE        LIV Rm           /BD RM          OUTSIDE

 6/14/73    0000-0200            ******          ******          ******          ******
 6/14/73    0200-0400            ******          ******          ******          ******
 6/14/73    0400-0600            ******          ******          ******          ******
 6/14/73    0600-0800            ******          ******          ******          ******
 6/14/73    0800-1000            ******          ******          ******          ******
 6/14/73    1000-1200            ******          ******          ******          ******
 6/14/73    1200-1400            ******          ******          ******          ******
 6/14/73    1400-1600           71.3 ( 6)       30.5 ( 6)       54.7 ( 6)       26.7 ( 6)
 6/14/73    1600-1800          439.4 ( 6)       45.2 ( 6)       75.1 ( 6)       93.5 ( 6)
 6/14/73    1800-2000          395.2 ( 6)       73.8 ( 6)      105.6 ( 6)       38.2 ( 6)
 6/14/73    2000-2200          227.5 ( 6)       56.0 ( 6)       54.7 ( 6)       41.4 ( 6)
 6/14/73    2200-2400          101.2 ( 6)       58.5 ( 6)       52.8 ( 6)       40.1 ( 6)



 6/15/73    0000-0200           94.2 ( 6)       71.3 ( 6)       51.5 ( 6)       40.7 ( 6)
 6/15/73    0200-0400           87.8 ( 6)       59.2 ( 6)       42.6 ( 6)       22.3 ( 6)
 6/15/73    0400-0600           82.1 ( 6)       64.9 ( 6)       45.2 ( 6)       31.8 ( 6)
 6/15/73    0600-0800          108.2 ( 6)       73.2 ( 6)       56.0 ( 6)       52.8 ( 6)
 6/15/73    0800-1000          103.7 ( 6)       66.8 ( 6)       61.1 ( 6)       34.4 ( 6)
 6/15/73    1000-1200           85.9 ( 6)       38.2 ( 6)       36.3 ( 6)       22.3 ( 6)
 6/15/73    1200-1400           87.8 ( 6)       34.4 ( 6)       33.7 ( 6)       24.8 ( 6)
 6/15/73    1400-1600           96.1 ( 6)       35.0 ( 6)       36.9 ( 6)       28.6 ( 6)
 6/15/73    1600-1800          109.4 ( 6)       66.2 ( 6)       56.0 ( 6)       47.7 ( 6)
 6/15/73    1800-2000          108.2 ( 6)       54.6 ( 6)       61.7 ( 6)       48.4 ( 6)
 6/15/73    2000-2200           97.4 ( 2)       59.2 ( 2)       55.4 ( 2)       45.8 ( 2)
 6/15/73    2200-2400           ******          ******          ******          ******



 6/20/73    0000-0200           ******          ******          ******          ******
 6/20/73    0200-0400           ******          ******          ******          ******
 6/20/73    0400-0600           ******          ******          ******          ******
 6/20/73    0600-0800           ******          ******          ******          ******
 6/20/73    0800-1000           ******          ******          ******          ******
 6/20/73    1000-1200           95.4 ( 3)       59.8 ( 3)       40.7 ( 3)       35.6 ( 3)
 6/20/73    1200-1400          120.3 ( 6)       66.8 ( 6)       50.9 ( 6)       31.2 ( 6)
 6/20/73    1400-1600          131.9 ( 6)       63.6 ( 6)       53.5 ( 6)       29.3 ( 6)
 6/20/73    1600-1800          111.4 ( 6)       73.2 ( 6)       54.7 ( 6)       32.5 ( 6)
 6/20/73    1800-2000           37.8 ( 6)       45.8 ( 6)       50.9 ( 6)       37.5 ( 6)
 6/20/73    2000-2200          129.2 ( 6)       77.6 ( 6)       69.4 ( 6)       56.6 ( 6)
 6/20/73    2200-2400          103.7 ( 6)       77.6 ( 6)       58.5 ( 6)       58.5 ( 6)
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HOUSE  3  SPRING-SUMMER       NO2 AVERAGE CONCENTRATIONS , UG/M3
   VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
       MAX.: 6 PER 2HR,72 PER DAY

                                                        STATION
   DATE         TIME            1             2             3            4
                           OVER STOVE      Liv Rm        BED RM       OUTSIDE

  6/21/73   0000-0200        92.3 ( 6)    64.9 ( 6)    43.3 ( 6)    37.5 ( 6)
  6/21/73   0200-0400        85.9 ( 6)    58.5 ( 6)    41.4 ( 6)    26.1 ( 6)
  6/21/73   0400-0600        77.0 ( 6)    57.9 ( 6)    42.0 ( 6)    22.3 ( 6)
  6/21/73   0600-0800        89.7 ( 6)    80.8 ( 6)    43.3 ( 6)    32.5 ( 6)
  6/21/73   0800-1000       205.9 ( 6)   115.2 ( 6)    73.8 ( 6)    47.7 ( 6)
  6/21/73   1000-1200       120.3 ( 6)    71.3 ( 6)    62.4 ( 6)    55.4 ( 6)
  6/21/73   1200-1400       134.3 ( 6)    82.7 ( 6)    56.6 ( 6)    46.6 ( 5)
  6/21/73   1400-1600       148.3 ( 6)   103.1 ( 6)    58.5 ( 6)    53.5 ( 6)
  6/21/73   1600-1800       141.3 ( 6)    85.3 ( 6)    57.3 ( 6)    52.2 ( 6)
  6/21/73   1800-2000        99.3 ( 6)    55.4 ( 6)    53.5 ( 6)    45.8 ( 6)
  6/21/73   2000-2200        96.1 ( 6)    60.5 ( 6)    54.1 ( 6)    47.1 ( 6)
  6/21/73   2200-2400        98.0 ( 6)    61.1 ( 6)    47.7 ( 6)    32.5 ( 6)

 DAILY AVERAGE =            115.7         74.7         52.8         41.6
  (AVG OF 2HR VALUES)


  6/22/73   0000-0200       103.1 ( 6)    66.8 ( 6)    47.7 ( 6)    31.8 ( 6)
  6/22/73   0200-0400        83.4 ( 6)    59.2 ( 6)    47.1 ( 6)    36.9 ( 6)
  6/22/73   0400-0600        88.5 ( 6)    57.9 ( 6)    49.0 ( 6)    45.8 ( 6)
  6/22/73   0600-0800        96.1 ( 6)    63.6 ( 6)    47.1 ( 6)    51.5 ( 6)
  6/22/73   0800-1000       112.6 ( 6)    82.7 ( 6)    70.0 ( 6)    59.2 ( 6)
  6/22/73   1000-1200       131.7 ( 6)    87.8 ( 6)    77.0 ( 6)    71.9 ( 6)
  6/22/73   1200-1400       134.3 ( 6)    89.1 ( 6)    77.0 ( 6)    65.5 ( 6)
  6/22/73   1400-1600       113.3 ( 3)    73.8 ( 3)    66.2 ( 3)    66.2 ( 3)
  6/22/73   1600-1800       130.4 ( 6)    88.5 ( 6)    73.8 ( 6)    83.4 ( 6)
  6/22/73   1800-2000       112.0 ( 6)    67.5 ( 6)    54.1 ( 6)    72.5 ( 6)
  6/22/73   2000-2200       122.2 ( 6)    76.4 ( 6)    65.5 ( 6)    70.0 ( 6)
  6/22/73   2200-2400       106.9 ( 6)    91.0 ( 6)    70.6 ( 6)    66.2 ( 6)

 DAILY AVERAGE =            111.2         75.4         62.1         60.1
  (AVG OF 2HR VALUES)
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HOUSE  3  SPRING-SUMMER       NO  AVERAGE CONCENTRATIONS , UG/M3
   VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
      MAX.: 6 PER 2HR,72 PER DAY

                                                  STATION
  DATE         TIME            1              2                3            4
                           OVER STOVE      Liv Rm           /BD RM      OUTSIDE

 6/14/73   0000-0200        ******         ******          ******       ******
 6/14/73   0200-0400        ******         ******          ******       ******
 6/14/73   0400-0600        ******         ******          ******       ******
 6/14/73   0600-0800        ******         ******          ******       ******
 6/14/73   0800-1000        ******         ******          ******       ******
 6/14/73   1000-1200        ******         ******          ******       ******
 6/14/73   1200-1400        ******         ******          ******       ******
 6/14/73   1400-1600      17.6 ( 6)      6.3 ( 6)     26.3 ( 6)      5.4 ( 6)
 6/14/73   1600-1800     372.9 ( 6)     14.6 ( 6)     18.4 ( 6)     44.7 ( 6)
 6/14/73   1800-2000     292.8 ( 6)     16.7 ( 6)     30.9 ( 6)      7.5 ( 6)
 6/14/73   2000-2200      96.3 ( 6)      9.6 ( 6)      9.2 ( 6)      7.5 ( 6)
 6/14/73   2200-2400      31.8 ( 6)     10.9 ( 6)      9.5 ( 6)      6.4 ( 6)



 6/15/73   0000-0200      32.6 ( 6)     14.6 ( 6)      9.2 ( 6)      6.7 ( 6)
 6/15/73   0200-0400      31.3 ( 6)     11.3 ( 6)      8.8 ( 6)      6.3 ( 6)
 6/15/73   0400-0600      33.9 ( 6)     15.5 ( 6)     11.7 ( 6)      9.2 ( 6)
 6/15/73   0600-0800      46.4 ( 6)     25.5 ( 6)     20.9 ( 6)     23.0 ( 6)
 6/15/73   0800-1000      46.8 ( 6)     27.6 ( 6)     28.0 ( 6)     14.2 ( 6)
 6/15/73   1000-1200      30.1 ( 6)     14.2 ( 6)     10.9 ( 6)     10.9 ( 6)
 6/15/73   1200-1400      30.9 ( 6)     10.9 ( 6)     10.4 ( 6)     10.9 ( 6)
 6/15/73   1400-1600      31.8 ( 6)     12.1 ( 6)     10.9 ( 6)     11.7 ( 6)
 6/15/73   1600-1800      35.5 ( 6)     15.9 ( 6)     12.5 ( 6)     12.1 ( 6)
 6/15/73   1800-2000      44.3 ( 6)     30.9 ( 6)     21.3 ( 6)     13.4 ( 6)
 6/15/73   2000-2200      53.9 ( 2)     35.1 ( 2)     41.4 ( 2)     42.6 ( 2)
 6/15/73   2200-2400        ******         ******          ******       ******



 6/20/73   0000-0200        ******         ******          ******       ******
 6/20/73   0200-0400        ******         ******          ******       ******
 6/20/73   0400-0600        ******         ******          ******       ******
 6/20/73   0600-0800        ******         ******          ******       ******
 6/20/73   0800-1000        ******         ******          ******       ******
 6/20/73   1000-1200      66.0 ( 3)     34.3 ( 3)     11.7 ( 3)     10.9 ( 3)
 6/20/73   1200-1400      51.4 ( 6)     32.6 ( 6)     12.5 ( 6)      7.9 ( 6)
 6/20/73   1400-1600     106.8 ( 6)     22.6 ( 6)      9.2 ( 6)      5.0 ( 6)
 6/20/73   1600-1800      69.0 ( 6)     55.2 ( 6)     18.4 ( 6)      6.7 ( 6)
 6/20/73   1800-2000      23.8 ( 6)      8.4 ( 6)      9.2 ( 6)      5.9 ( 6)
 6/20/73   2000-2200      34.3 ( 6)     23.8 ( 6)     18.4 ( 6)      5.0 ( 6)
 6/20/73   2200-2400      55.2 ( 6)     50.2 ( 6)     46.4 ( 6)     39.3 ( 6)
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HOUSE  3  SPRING-SUMMER       NO  AVERAGE CONCENTRATIONS , UG/M3
   VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
      MAX.: 6 PER 2HR,72 PER DAY

                                                       STATION
  DATE          TIME             1               2                3              4
                             OVER STOVE                         /BD RM        OUTSIDE

  6/21/73   0000-0200        52.7 ( 6)      48.1 ( 6)      39.7 ( 6)      14.2 ( 6)
  6/21/73   0200-0400        32.2 ( 6)      26.8 ( 6)      18.0 ( 6)       7.5 ( 6)
  6/21/73   0400-0600        33.4 ( 6)      25.9 ( 6)      16.7 ( 6)       7.5 ( 6)
  6/21/73   0600-0800        43.5 ( 6)      58.5 ( 6)      32.6 ( 6)      23.8 ( 6)
  6/21/73   0800-1000       127.7 ( 6)      80.7 ( 6)      64.0 ( 6)      33.4 ( 6)
  6/21/73   1000-1200        32.6 ( 6)      18.4 ( 6)      13.0 ( 6)      12.5 ( 6)
  6/21/73   1200-1400        45.6 ( 6)      33.4 ( 6)      12.1 ( 6)       8.5 ( 6)
  6/21/73   1400-1600        39.7 ( 6)      24.7 ( 6)      10.0 ( 6)      10.4 ( 6)
  6/21/73   1600-1800        28.4 ( 6)      12.5 ( 6)       6.7 ( 6)       6.7 ( 6)
  6/21/73   1800-2000        23.4 ( 6)      10.9 ( 6)      10.9 ( 6)      10.0 ( 6)
  6/21/73   2000-2200        30.1 ( 6)      15.9 ( 6)      15.0 ( 6)      11.7 ( 6)
  6/21/73   2200-2400        50.2 ( 6)      40.5 ( 6)      37.2 ( 6)      10.4 ( 6)

DAILY AVERAGE =              45.0           33.0           23.0           13.1
 (AVG OF 2HR VALUES)


  6/22/73   0000-0200        53.1 ( 6)      47.7 ( 6)      42.2 ( 6)      10.0 ( 6)
  6/22/73   0200-0400        31.3 ( 6)      22.2 ( 6)      18.0 ( 6)      11.7 ( 6)
  6/22/73   0400-0600        31.3 ( 6)      23.0 ( 6)      20.1 ( 6)      11.7 ( 6)
  6/22/73   0600-0800        50.2 ( 6)      43.1 ( 6)      40.1 ( 6)      33.0 ( 6)
  6/22/73   0800-1000        57.3 ( 6)      56.0 ( 6)      51.8 ( 6)      31.8 ( 6)
  6/22/73   1000-1200        42.6 ( 6)      30.1 ( 6)      22.6 ( 6)      19.2 ( 6)
  6/22/73   1200-1400        59.4 ( 6)      46.8 ( 6)      19.2 ( 6)      11.7 ( 6)
  6/22/73   1400-1600        24.2 ( 3)      11.7 ( 3)      11.7 ( 3)      11.7 ( 3)
  6/22/73   1600-1800        64.8 ( 6)      53.9 ( 6)      51.8 ( 6)      26.8 ( 6)
  6/22/73   1800-2000        82.8 ( 6)      66.0 ( 6)      62.3 ( 6)      24.2 ( 6)
  6/22/73   2000-2200        92.8 ( 6)      82.8 ( 6)      83.2 ( 6)      64.8 ( 6)
  6/22/73   2200-2400       125.0 ( 6)     121.2 ( 6)     121.6 ( 6)      94.0 ( 6)

DAILY AVERAGE =              59.6           50.4           45.4           29.2
 (AVG OF 2HR VALUES)
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HOUSE  3  SPRING-SUMMER        NO  AVERAGE CONCENTRATIONS , UG/M3
   VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
      MAX.: 6 PER 2HR,72 PER DAY

                                                   STATION
  DATE        TIME            1             2              3            4
                          OVER STOVE     LIV Rm          BD RM      OUTSIDE


 6/27/73   0000-0200        ******        ******         ******       ******
 6/27/73   0200-0400        ******        ******         ******       ******
 6/27/73   0400-0600        ******        ******         ******       ******
 6/27/73   0600-0800        ******        ******         ******       ******
 6/27/73   0800-1000        ******        ******         ******       ******
 6/27/73   1000-1200      15.0 ( 1)     12.5 ( 1)      15.0 ( 1)    12.5 ( 1)
 6/27/73   1200-1400      28.8 ( 6)     24.7 ( 6)      23.9 ( 6)    23.8 ( 6)
 6/27/73   1400-1600      25.1 ( 6)     23.8 ( 6)      24.7 ( 6)    18.0 ( 5)
 6/27/73   1600-1800      17.6 ( 2)     16.3 ( 2)      13.8 ( 2)    15.0 ( 2)
 6/27/73   1800-2000        ******        ******         ******       ******
 6/27/73   2000-2200        ******        ******         ******       ******
 6/27/73   2200-2400        ******        ******         ******       ******
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HOUSE  3   SPRING-SUMMER  CO AVERAGE CONCENTRATIONS ,UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
      MAX.: 6 PER 2HR,72 PER DAY

                                                      STATION
   DATE         TIME            1              2                3              4
                            OVER STOVE      Liv Rm            BD RM        OUTSIDE

 6/20/73   0000-0200         ******         ******          ******         ******
 6/20/73   0200-0400         ******         ******          ******         ******
 6/20/73   0400-0600         ******         ******          ******         ******
 6/20/73   0600-0800         ******         ******          ******         ******
 6/20/73   0800-1000         ******         ******          ******         ******
 6/20/73   1000-1200         ******         ******          ******         ******
 6/20/73   1200-1400       4305. ( 4)    3396. ( 4)     2755. ( 4)     1526. ( 4)
 6/20/73   1400-1600       3154. ( 6)    2384. ( 6)     1849. ( 6)     1421. ( 6)
 6/20/73   1600-1800       4168. ( 6)    3242. ( 6)     1674. ( 6)      961. ( 6)
 6/20/73   1800-2000       3177. ( 6)    2062. ( 6)     1933. ( 6)     1598. ( 6)
 6/20/73   2000-2200       2915. ( 6)    2095. ( 6)     2095. ( 6)     1311. ( 6)
 6/20/73   2200-2400         ******         ******          ******         ******



 6/21/73   0000-0200         ******         ******          ******         ******
 6/21/73   0200-0400       1603. ( 2)    1495. ( 2)     1175. ( 2)      748. ( 2)
 6/21/73   0400-0600       1710. ( 6)    1460. ( 6)     1032. ( 6)      641. ( 6)
 6/21/73   0600-0800       2101. ( 6)    2280. ( 6)     1638. ( 6)     1211. ( 6)
 6/21/73   0800-1000       3887. ( 6)    3509. ( 6)     2761. ( 6)     1514. ( 6)
 6/21/73   1000-1200       2921. ( 6)    2066. ( 6)     1567. ( 6)     1389. ( 6)
 6/21/73   1200-1400       4346. ( 6)    3919. ( 6)     1710. ( 6)     1567. ( 6)
 6/21/73   1400-1600       5255. ( 6)    4344. ( 6)     2084. ( 6)     1656. ( 6)
 6/21/73   1600-1800       3954. ( 6)    2814. ( 6)     1745. ( 6)     1567. ( 6)
 6/21/73   1800-2000       2565. ( 6)    1532. ( 6)     1603. ( 6)     1460. ( 6)
 6/21/73   2000-2200       2333. ( 6)    1514. ( 6)     1549. ( 6)     1300. ( 6)
 6/21/73   2200-2400       3064. ( 6)    2316. ( 6)     2031. ( 6)      926. ( 6)



 6/22/73   0000-0200       2993. ( 6)    2280. ( 6)     1959. ( 6)      961. ( 6)
 6/22/73   0200-0400       2013. ( 6)    1514. ( 6)     1585. ( 6)     1086. ( 6)
 6/22/73   0400-0600       2316. ( 6)    1852. ( 6)     1710. ( 6)     1460. ( 6)
 6/22/73   0600-0800       1520. ( 6)     986. ( 6)      985. ( 6)      665. ( 6)
 6/22/73   0800-1000       1978. ( 6)    1850. ( 6)     1621. ( 6)     1087. ( 6)
 6/22/73   1000-1200       4545. ( 6)    2599. ( 6)     2774. ( 6)     2639. ( 6)
 6/22/73   1200-1400       5863. ( 6)    4910. ( 6)     3701. ( 6)     2821. ( 6)
 6/22/73   1400-1600       2718. ( 5)    1815. ( 5)     1772. ( 5)     1184. ( 5)
 6/22/73   1600-1800       4341. ( 6)    3558. ( 6)     2809. ( 6)     2132. ( 6)
 6/22/73   1800-2000       4245. ( 6)    3319. ( 6)     2927. ( 6)     1608. ( 6)
 6/22/73   2000-2200       3513. ( 6)    3477. ( 6)     3334. ( 6)     2408. ( 6)
 6/22/73   2200-2400       5208. ( 6)    4495. ( 6)     4389. ( 6)     3640. ( 6)

DAILY AVERAGE =            3438.         2721.          2464.          1808.
 (AVG OF 2HR VALUES)
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HOUSE  3   SPRING-SUMMER  CO AVERAGE CONCENTRATIONS ,UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                  STATION
 DATE         TIME            1              2               3              4
                         OVER STOVE       Liv Rm          /BD RM         OUTSIDE

 6/23/73   0000-0200     4198. ( 7)    3806. ( 7)    3500. ( 7)    2615. ( 7)
 6/23/73   0200-0400     3096. ( 6)    2704. ( 6)    2419. ( 6)    1742. ( 6)
 6/23/73   0400-0600     2868. ( 6)    2404. ( 6)    2226. ( 6)    1442. ( 6)
 6/23/73   0600-0800     3341. ( 6)    2914. ( 6)    2771. ( 6)    2201. ( 6)
 6/23/73   0800-1000     3998. ( 6)    3322. ( 6)    3393. ( 6)    2894. ( 6)
 6/23/73   1000-1200     4559. ( 5)    3832. ( 5)    4302. ( 5)    4117. ( 5)
 6/23/73   1200-1400     4596. ( 6)    3527. ( 6)    3598. ( 6)    2850. ( 6)
 6/23/73   1400-1600     3218. ( 6)    1970. ( 6)    1507. ( 6)    1472. ( 6)
 6/23/73   1600-1800     3242. ( 6)    2280. ( 6)    2209. ( 6)    2138. ( 6)
 6/23/73   1800-2000     5295. ( 6)    5201. ( 6)    5629. ( 6)    6306. ( 6)
 6/23/73   2000-2200     5023. ( 6)    4168. ( 6)    4417. ( 6)    5095. ( 6)
 6/23/73   2200-2400     3491. ( 6)    2351. ( 6)    2565. ( 6)    2565. ( 6)

DAILY AVERAGE =          3910.         3207.         3211.         2953.
 (AVG OF 2HR VALUES)


 6/24/73   0000-0200     4133. ( 6)    2529. ( 6)    2672. ( 6)    2707. ( 6)
 6/24/73   0200-0400     3705. ( 6)    2422. ( 6)    2494. ( 6)    2351. ( 6)
 6/24/73   0400-0600     3384. ( 6)    1995. ( 6)    2066. ( 6)    1817. ( 6)
 6/24/73   0600-0800     3135. ( 6)    2138. ( 6)    2244. ( 6)    2031. ( 6)
 6/24/73   0800-1000     4988. ( 6)    2173. ( 6)    2209. ( 6)    1282. ( 6)
 6/24/73   1000-1200     1482. ( 6)     641. ( 6)     854. ( 6)     342. ( 5)
 6/24/73   1200-1400     2636. ( 6)    1389. ( 6)     676. ( 6)     498. ( 6)
 6/24/73   1400-1600     3491. ( 6)    2209. ( 6)    1496. ( 6)    1389. ( 6)
 6/24/73   1600-1800     3901. ( 6)    3153. ( 6)    2048. ( 6)     908. ( 6)
 6/24/73   1800-2000     5451. ( 6)    4524. ( 6)    2529. ( 6)    1603. ( 6)
 6/24/73   2000-2200     5059. ( 6)    4026. ( 6)    3064. ( 6)    1995. ( 6)
 6/24/73   2200-2400     5490. ( 6)    5433. ( 6)    6074. ( 6)    4506. ( 6)

DAILY AVERAGE =          3905.         2719.         2369.         1786.
 (AVG OF 2HR VALUES)


 6/25/73   0000-0200     8087. ( 6)    6306. ( 6)    6626. ( 6)    6377. ( 6)
 6/25/73   0200-0400     6805. ( 6)    4987. ( 6)    5303. ( 6)    4952. ( 6)
 6/25/73   0400-0600     3519. ( 6)    1809. ( 6)    2023. ( 6)    1667. ( 6)
 6/25/73   0600-0800     4553. ( 6)    2843. ( 6)    3092. ( 6)    2701. ( 6)
 6/25/73   0800-1000     5024. ( 6)    3491. ( 6)    3776. ( 6)    2957. ( 6)
 6/25/73   1000-1200     2160. ( 6)    2721. ( 6)    1973. ( 6)    1061. ( 6)
 6/25/73   1200-1400     2515. ( 6)    2097. ( 6)    1517. ( 6)    1481. ( 6)
 6/25/73   1400-1600     2422. ( 6)     840. ( 6)     890. ( 6)     676. ( 6)
 6/25/73   1600-1800     3393. ( 6)    2039. ( 6)    2039. ( 6)    1861. ( 6)
 6/25/73   1800-2000     3044. ( 6)    2046. ( 6)    1797. ( 6)    1405. ( 6)
 6/25/73   2000-2200     3790. ( 6)    2686. ( 6)    3042. ( 6)    2223. ( 6)
 6/25/73   2200-2400     6475. ( 6)    4244. ( 6)    4523. ( 6)    3781. ( 6)

DAILY AVERAGE =          4316.         3008.         3051.         2595.
 (AVG OF 2HR VALUES)
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```
HOUSE  3   SPRING-SUMMER  CO AVERAGE CONCENTRATIONS ,UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                     STATION
   DATE          TIME            1              2                 3             4
                            OVER STOVE      LIV Rm             /BD RM       OUTSIDE

  6/26/73   0000-0200       4571. ( 6)    3610. ( 6)    3538. ( 6)    3075. ( 6)
  6/26/73   0200-0400       2364. ( 6)    2613. ( 6)    2685. ( 6)    2399. ( 6)
  6/26/73   0400-0600       2202. ( 6)     777. ( 6)     884. ( 6)     813. ( 6)
  6/26/73   0600-0800       2669. ( 6)    1172. ( 6)    1457. ( 6)    1386. ( 6)
  6/26/73   0800-1000       4460. ( 6)    2358. ( 6)    1895. ( 6)    1610. ( 6)
  6/26/73   1000-1200       3938. ( 6)    2980. ( 6)    2909. ( 6)    2802. ( 6)
  6/26/73   1200-1400       3091. ( 6)    1808. ( 6)    1808. ( 6)    1665. ( 6)
  6/26/73   1400-1600       2296. ( 6)    1082. ( 6)    1227. ( 6)    1156. ( 6)
  6/26/73   1600-1800       2983. ( 6)    1843. ( 6)    1701. ( 6)    1380. ( 6)
  6/26/73   1800-2000       2824. ( 6)    2402. ( 6)    1690. ( 6)     906. ( 6)
  6/26/73   2000-2200       4311. ( 6)    2829. ( 6)    2579. ( 6)    1973. ( 6)
  6/26/73   2200-2400       3442. ( 6)    2836. ( 6)    2551. ( 6)    2694. ( 6)

 DAILY AVERAGE =            3263.         2193.         2077.         1822.
  (AVG OF 2HR VALUES)


  6/27/73   0000-0200       4743. ( 6)    2283. ( 6)    2635. ( 6)    2248. ( 6)
  6/27/73   0200-0400       3795. ( 6)    2178. ( 6)    2283. ( 6)    1405. ( 6)
  6/27/73   0400-0600       3830. ( 6)    1616. ( 6)    1897. ( 6)    1265. ( 6)
  6/27/73   0600-0800       4076. ( 6)    1686. ( 6)    2108. ( 6)    1475. ( 6)
  6/27/73   0800-1000       3852. ( 5)    1918. ( 5)    2002. ( 5)    1328. ( 5)
  6/27/73   1000-1200       3584. ( 6)    2354. ( 6)    2354. ( 6)    1792. ( 6)
  6/27/73   1200-1400       2776. ( 6)    1265. ( 6)    1229. ( 6)     913. ( 6)
  6/27/73   1400-1600       2512. ( 6)    1177. ( 6)     931. ( 6)     931. ( 6)
  6/27/73   1600-1800       2002. ( 6)     703. ( 6)     632. ( 6)     527. ( 6)
  6/27/73   1800-2000       3338. ( 7)    1716. ( 7)    1385. ( 7)     903. ( 7)
  6/27/73   2000-2200       4568. ( 6)    2846. ( 6)    2986. ( 6)    2846. ( 6)
  6/27/73   2200-2400       6254. ( 6)    4778. ( 6)    4603. ( 6)    4111. ( 6)

 DAILY AVERAGE =            3777.         2043.         2087.         1645.
  (AVG OF 2HR VALUES)


  6/29/73   0000-0200       3479. ( 6)    2459. ( 6)    1967. ( 6)    1229. ( 6)
  6/29/73   0200-0400       3092. ( 6)    2037. ( 6)    1581. ( 6)     759. ( 5)
  6/29/73   0400-0600       2776. ( 6)    1756. ( 6)    1335. ( 6)     632. ( 6)
  6/29/73   0600-0800       3198. ( 6)    2002. ( 6)    1721. ( 6)    1019. ( 6)
  6/29/73   0800-1000       2951. ( 6)    1791. ( 6)    1475. ( 6)    1019. ( 6)
  6/29/73   1000-1200       2494. ( 6)     913. ( 6)     878. ( 6)     773. ( 6)
  6/29/73   1200-1400       2389. ( 6)     738. ( 6)     667. ( 6)     667. ( 6)
  6/29/73   1400-1600       2108. ( 1)     843. ( 1)     843. ( 1)     843. ( 1)
  6/29/73   1600-1800        ******        ******        ******        ******
  6/29/73   1800-2000        ******        ******        ******        ******
  6/29/73   2000-2200        ******        ******        ******        ******
  6/29/73   2200-2400        ******        ******        ******        ******
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HOUSE  3   SPRING-SUMMER  CO AVERAGE CONCENTRATIONS ,UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                   STATION
   DATE         TIME            1              2                3              4
                            OVER STOVE      Liv Rm           /BD RM        OUTSIDE

 7/ 5/73   0000-0200         ******         ******          ******         ******
 7/ 5/73   0200-0400         ******         ******          ******         ******
 7/ 5/73   0400-0600         ******         ******          ******         ******
 7/ 5/73   0600-0800         ******         ******          ******         ******
 7/ 5/73   0800-1000         ******         ******          ******         ******
 7/ 5/73   1000-1200         ******         ******          ******         ******
 7/ 5/73   1200-1400         ******         ******          ******         ******
 7/ 5/73   1400-1600       2791. ( 3)    1660. ( 3)    1886. ( 3)    1584. ( 3)
 7/ 5/73   1600-1800       1369. ( 6)    1228. ( 6)    1303. ( 6)    1076. ( 6)
 7/ 5/73   1800-2000       2882. ( 6)    1649. ( 6)    4162. ( 6)    2766. ( 6)
 7/ 5/73   2000-2200       4380. ( 6)    3588. ( 6)    3323. ( 6)    2758. ( 6)
 7/ 5/73   2200-2400       4288. ( 6)    3043. ( 6)    2893. ( 6)    2176. ( 6)




 7/ 6/73   0000-0200       2997. ( 6)    1865. ( 6)    1865. ( 6)    1299. ( 6)
 7/ 6/73   0200-0400       2498. ( 6)    1366. ( 6)    1404. ( 6)     839. ( 6)
 7/ 6/73   0400-0600       2671. ( 6)    1539. ( 6)    1614. ( 6)    1011. ( 6)
 7/ 6/73   0600-0800       3622. ( 5)    2399. ( 5)    2490. ( 5)    1902. ( 5)
 7/ 6/73   0800-1000       3009. ( 6)    1862. ( 6)    1749. ( 6)    1409. ( 6)
 7/ 6/73   1000-1200       3995. ( 6)    2539. ( 6)    2486. ( 6)    2184. ( 6)
 7/ 6/73   1200-1400       3157. ( 6)    1988. ( 6)    1761. ( 6)    1422. ( 6)
 7/ 6/73   1400-1600       2583. ( 6)    1520. ( 6)    1451. ( 6)    1262. ( 6)
 7/ 6/73   1600-1800       3543. ( 7)    2121. ( 7)    2282. ( 7)    2185. ( 7)
 7/ 6/73   1800-2000       4482. ( 6)    2746. ( 6)    2860. ( 6)    2746. ( 6)
 7/ 6/73   2000-2200       7303. ( 6)    5568. ( 6)    5983. ( 6)    5530. ( 6)
 7/ 6/73   2200-2400       9173. ( 6)    8305. ( 6)    8456. ( 6)    7890. ( 6)

DAILY AVERAGE =            4086.         2823.         2867.         2473.
 (AVG OF 2HR VALUES)


 7/ 7/73   0000-0200       8863. ( 6)    7391. ( 6)    7263. ( 6)    7354. ( 6)
 7/ 7/73   0200-0400       7534. ( 6)    6214. ( 6)    6327. ( 6)    5497. ( 6)
 7/ 7/73   0400-0600       5216. ( 6)    4311. ( 6)    4348. ( 6)    3179. ( 6)
 7/ 7/73   0600-0800       4227. ( 6)    3058. ( 6)    3171. ( 6)    1714. ( 6)
 7/ 7/73   0800-1000       4068. ( 6)    2785. ( 6)    2747. ( 6)    1163. ( 6)
 7/ 7/73   1000-1200       3296. ( 6)    2240. ( 6)    1373. ( 6)     920. ( 6)
 7/ 7/73   1200-1400       2120. ( 6)     687. ( 6)     875. ( 6)     667. ( 6)
 7/ 7/73   1400-1600       3788. ( 6)    2619. ( 6)     921. ( 6)     997. ( 6)
 7/ 7/73   1600-1800       5842. ( 6)    4711. ( 6)    3315. ( 6)    3428. ( 6)
 7/ 7/73   1800-2000       8166. ( 6)    8680. ( 6)    5499. ( 6)    7624. ( 6)
 7/ 7/73   2000-2200       8665. ( 6)    9254. ( 6)    7231. ( 6)    7594. ( 6)
 7/ 7/73   2200-2400       9007. ( 6)    8177. ( 6)    7800. ( 6)    6932. ( 6)

DAILY AVERAGE =            5899.         5010.         4233.         3924.
 (AVG OF 2HR VALUES)
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HØUSE  3   SPRING-SUMMER  CØ AVERAGE CØNCENTRATIØNS ,UG/M3
  VALUES IN ( ) ARE NØ. ØF ØBSERVATIØNS IN PERIØD
     MAX.: 6 PER 2HR,72 PER DAY

                                                   STATIØN
   DATE        TIME              1             2             3             4
                             ØVER STØVE      Liv Rm        /BD RM       ØUTSIDE

   7/ 8/73   0000-0200      5620. ( 6)    4639. ( 6)    4413. ( 6)    3432. ( 6)
   7/ 8/73   0200-0400      4194. ( 6)    3327. ( 6)    3176. ( 6)    1969. ( 6)
   7/ 8/73   0400-0600      3041. ( 6)    2061. ( 6)    1910. ( 6)     778. ( 6)
   7/ 8/73   0600-0800      2635. ( 6)    1654. ( 6)    1616. ( 6)     447. ( 6)
   7/ 8/73   0800-1000      2820. ( 6)    2568. ( 6)    1624. ( 6)     681. ( 6)
   7/ 8/73   1000-1200      3188. ( 6)    2509. ( 6)    1339. ( 6)     510. ( 6)
   7/ 8/73   1200-1400      2357. ( 6)    1687. ( 6)     323. ( 6)     518. ( 6)
   7/ 8/73   1400-1600      3280. ( 6)    2035. ( 6)     639. ( 6)     715. ( 6)
   7/ 8/73   1600-1800      3032. ( 6)    1674. ( 6)     316. ( 6)     354. ( 6)
   7/ 8/73   1800-2000      5568. ( 6)    4022. ( 6)     928. ( 6)    2400. ( 6)
   7/ 8/73   2000-2200      8482. ( 6)    7954. ( 6)    6180. ( 6)    5848. ( 6)
   7/ 8/73   2200-2400     10158. ( 6)    8913. ( 6)    6423. ( 6)    6310. ( 6)

 DAILY AVERAGE =            4573.         3587.         2408.         1997.
  (AVG ØF 2HR VALUES)


   7/ 9/73   0000-0200      6620. ( 6)    5677. ( 6)    3451. ( 6)    2471. ( 6)
   7/ 9/73   0200-0400      4327. ( 6)    3233. ( 6)    2328. ( 6)    1196. ( 6)
   7/ 9/73   0400-0600      2835. ( 6)    1779. ( 6)    1401. ( 6)     534. ( 6)
   7/ 9/73   0600-0800      3258. ( 6)    2277. ( 6)    1900. ( 6)    1221. ( 6)
   7/ 9/73   0800-1000      4134. ( 6)    2937. ( 6)    1606. ( 6)    2419. ( 6)
   7/ 9/73   1000-1200      3849. ( 6)    2529. ( 6)    1057. ( 6)     452. ( 6)
   7/ 9/73   1200-1400      4497. ( 6)    3327. ( 6)    1555. ( 6)    1155. ( 6)
   7/ 9/73   1400-1600      3713. ( 6)    2657. ( 6)    1789. ( 6)    1865. ( 6)
   7/ 9/73   1600-1800      3202. ( 6)    1768. ( 6)     336. ( 6)     336. ( 6)
   7/ 9/73   1800-2000      3387. ( 6)    3172. ( 6)     555. ( 6)     481. ( 6)
   7/ 9/73   2000-2200      4803. ( 6)    3520. ( 6)    3077. ( 6)    3077. ( 6)
   7/ 9/73   2200-2400      7422. ( 6)    6404. ( 6)    3235. ( 6)    2442. ( 6)

 DAILY AVERAGE =            4337.         3273.         1858.         1471.
  (AVG ØF 2HR VALUES)


   7/10/73   0000-0200      6639. ( 6)    5658. ( 6)    2263. ( 6)    1547. ( 6)
   7/10/73   0200-0400      5696. ( 6)    4790. ( 6)    1999. ( 6)    1244. ( 6)
   7/10/73   0400-0600      5168. ( 6)    4263. ( 6)    2074. ( 6)    1471. ( 6)
   7/10/73   0600-0800      5847. ( 6)    4790. ( 6)    2414. ( 6)    2187. ( 6)
   7/10/73   0800-1000      6038. ( 6)    7420. ( 6)    5771. ( 6)    2640. ( 6)
   7/10/73   1000-1200      5762. ( 5)    5407. ( 5)    2920. ( 5)    2466. ( 5)
   7/10/73   1200-1400      4233. ( 6)    3115. ( 6)     944. ( 6)     812. ( 6)
   7/10/73   1400-1600      3458. ( 6)    2340. ( 6)    1090. ( 6)    1057. ( 6)
   7/10/73   1600-1800      4635. ( 6)    2859. ( 6)    1116. ( 6)    1182. ( 6)
   7/10/73   1800-2000      5296. ( 6)    3783. ( 6)    2073. ( 6)    1908. ( 6)
   7/10/73   2000-2200      5606. ( 6)    4554. ( 6)    3501. ( 6)    2811. ( 6)
   7/10/73   2200-2400      6027. ( 6)    4909. ( 6)    2213. ( 6)    1949. ( 6)

 DAILY AVERAGE =            5367.         4491.         2365.         1775.
  (AVG ØF 2HR VALUES)
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HOUSE  3   SPRING-SUMMER  CO AVERAGE CONCENTRATIONS ,UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
      MAX.: 6 PER 2HR,72 PER DAY

                                                      STATION
  DATE          TIME              1               2
                                                               3               4
                             OVER STOVE        Liv Rm          /BD RM        OUTSIDE

 7/11/73   0000-0200      7205. ( 6)   5884. ( 6)   1773. ( 6)   1282. ( 6)
 7/11/73   0200-0400      5356. ( 6)   4451. ( 6)   2602. ( 6)   1131. ( 6)
 7/11/73   0400-0600      3848. ( 6)   2716. ( 6)   2150. ( 6)   1018. ( 6)
 7/11/73   0600-0800      4036. ( 6)   2904. ( 6)   2376. ( 6)   1697. ( 6)
 7/11/73   0800-1000      5658. ( 6)   4942. ( 6)   4414. ( 6)   1961. ( 6)
 7/11/73   1000-1200      5922. ( 6)   4489. ( 6)   2376. ( 6)   1886. ( 6)
 7/11/73   1200-1400      4526. ( 6)   3244. ( 6)   2753. ( 6)   1773. ( 6)
 7/11/73   1400-1600      4489. ( 6)   2867. ( 6)   2263. ( 6)   1999. ( 6)
 7/11/73   1600-1800      4036. ( 6)   2489. ( 6)   2112. ( 6)   1622. ( 6)
 7/11/73   1800-2000      5356. ( 6)   3885. ( 6)   3621. ( 6)   4640. ( 6)
 7/11/73   2000-2200      7959. ( 6)   6828. ( 6)   6601. ( 6)   6111. ( 6)
 7/11/73   2200-2400      3432. ( 6)   2338. ( 6)   1999. ( 6)   1508. ( 6)

DAILY AVERAGE =           5152.        3920.        2920.        2219.
 (AVG OF 2HR VALUES)


 7/12/73   0000-0200      1735. ( 6)    905. ( 6)    754. ( 6)    452. ( 6)
 7/12/73   0200-0400      1358. ( 6)    528. ( 6)    452. ( 6)    226. ( 6)
 7/12/73   0400-0600      1519. ( 7)    743. ( 7)    517. ( 7)    498. ( 5)
 7/12/73   0600-0800      2402. ( 5)   1018. ( 6)   1244. ( 6)    679. ( 6)
 7/12/73   0800-1000      6564. ( 6)   3998. ( 6)   4451. ( 6)   3923. ( 6)
 7/12/73   1000-1200      6602. ( 6)   5432. ( 6)   6526. ( 6)   4828. ( 6)
 7/12/73   1200-1400      5545. ( 6)   4225. ( 6)   4262. ( 6)   3960. ( 6)
 7/12/73   1400-1600      2942. ( 5)   1856. ( 5)   1901. ( 5)   1720. ( 5)
 7/12/73   1600-1800      2451. ( 6)   1244. ( 6)   1244. ( 6)   1433. ( 6)
 7/12/73   1800-2000      5095. ( 6)   2339. ( 6)   2603. ( 6)   2678. ( 6)
 7/12/73   2000-2200      6451. ( 6)   5621. ( 6)   5960. ( 6)   6262. ( 6)
 7/12/73   2200-2400      5470. ( 6)   4829. ( 6)   4527. ( 6)   3848. ( 6)

DAILY AVERAGE =           4011.        2728.        2870.        2542.
 (AVG OF 2HR VALUES)


 7/13/73   0000-0200      3696. ( 6)   2829. ( 6)   2716. ( 6)   2678. ( 6)
 7/13/73   0200-0400      2829. ( 6)   1886. ( 6)   1886. ( 6)   1206. ( 6)
 7/13/73   0400-0600      2565. ( 6)   1622. ( 6)   1735. ( 6)    980. ( 6)
 7/13/73   0600-0800      3357. ( 6)   2376. ( 6)   2414. ( 6)   2075. ( 6)
 7/13/73   0800-1000      4753. ( 1)   3621. ( 1)   3621. ( 1)   2489. ( 1)
 7/13/73   1000-1200        ******       ******       ******       ******
 7/13/73   1200-1400        ******       ******       ******       ******
 7/13/73   1400-1600        ******       ******       ******       ******
 7/13/73   1600-1800        ******       ******       ******       ******
 7/13/73   1800-2000        ******       ******       ******       ******
 7/13/73   2000-2200        ******       ******       ******       ******
 7/13/73   2200-2400        ******       ******       ******       ******
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Appendix B-5

NO_2, NO, and CO data for House No. 3 - Fall/Winter

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HØUSE  -3   FALL-WINTER     NØ2 AVERAGE CØNCENTRATIØNS , UG/M3
  VALUES IN ( ) ARE NØ. ØF ØBSERVATIØNS IN PERIØD
     MAX.: 6 PER 2HR,72 PER DAY

                                                   STATIØN
  DATE        TIME            1
                                            1A           2                4
                         ØVER STØVE 1M FRØM STØVE LIV/    RM      ØUTSIDE

11/28/73   0000-0200        ******        ******        ******        ******
11/28/73   0200-0400        ******        ******        ******        ******
11/28/73   0400-0600        ******        ******        ******        ******
11/28/73   0600-0800        ******        ******        ******        ******
11/28/73   0800-1000        ******        ******        ******        ******
11/28/73   1000-1200        ******        ******        ******        ******
11/28/73   1200-1400        ******        ******        ******        ******
11/28/73   1400-1600       85.0 ( 2)     80.0 ( 2)     60.0 ( 1)     ******
11/28/73   1600-1800      266.2 ( 6)     98.7 ( 6)     58.5 ( 6)     70.0 ( 2)
11/28/73   1800-2000      415.3 ( 6)    159.3 ( 6)    115.8 ( 6)     65.0 ( 6)
11/28/73   2000-2200      173.8 ( 6)     95.2 ( 6)     78.0 ( 5)     68.3 ( 6)
11/28/73   2200-2400       97.0 ( 3)     62.5 ( 4)    124.0 ( 3)     53.3 ( 6)
                                                                     30.0 ( 3)



11/29/73   0000-0200       86.8 ( 6)     51.7 ( 6)     56.7 ( 6)     26.7 ( 6)
11/29/73   0200-0400       75.0 ( 6)     51.7 ( 6)     46.7 ( 6)     26.7 ( 6)
11/29/73   0400-0600       86.8 ( 6)     38.3 ( 6)     41.7 ( 6)     21.7 ( 6)
11/29/73   0600-0800       71.7 ( 6)     40.0 ( 6)     33.3 ( 6)     23.3 ( 6)
11/29/73   0800-1000      139.0 ( 6)     56.7 ( 6)     38.3 ( 6)     31.7 ( 6)
11/29/73   1000-1200        ******        ******        ******        ******
11/29/73   1200-1400        ******        ******        ******        ******
11/29/73   1400-1600       36.7 ( 3)     46.7 ( 3)     16.7 ( 3)     20.0 ( 3)
11/29/73   1600-1800      103.7 ( 6)     86.8 ( 6)     20.0 ( 6)     35.0 ( 6)
11/29/73   1800-2000      128.8 ( 6)     85.2 ( 6)     38.3 ( 6)     31.7 ( 6)
11/29/73   2000-2200      155.5 ( 6)     68.5 ( 6)     25.0 ( 6)     41.7 ( 6)
11/29/73   2200-2400       75.2 ( 6)     35.0 ( 6)     31.7 ( 6)     15.0 ( 6)



11/30/73   0000-0200       38.3 ( 6)     48.3 ( 6)     28.3 ( 6)     35.0 ( 6)
11/30/73   0200-0400       48.3 ( 6)     40.0 ( 6)     16.7 ( 6)     25.0 ( 6)
11/30/73   0400-0600       48.3 ( 6)     36.7 ( 6)     23.3 ( 6)     28.0 ( 5)
11/30/73   0600-0800       92.0 ( 6)     60.2 ( 6)     31.7 ( 6)     40.0 ( 6)
11/30/73   0800-1000       46.7 ( 6)     41.7 ( 6)     36.7 ( 6)     26.7 ( 6)
11/30/73   1000-1200       46.7 ( 6)     43.3 ( 6)     23.3 ( 6)     21.7 ( 6)
11/30/73   1200-1400       42.0 ( 5)     44.0 ( 5)     16.0 ( 5)     28.0 ( 5)
11/30/73   1400-1600       50.0 ( 4)     42.5 ( 4)     25.0 ( 4)     35.0 ( 4)
11/30/73   1600-1800       53.3 ( 6)     51.7 ( 6)     30.0 ( 6)     45.0 ( 6)
11/30/73   1800-2000       58.3 ( 6)     60.0 ( 6)     33.3 ( 6)     58.3 ( 6)
11/30/73   2000-2200       61.7 ( 6)     53.3 ( 6)     55.2 ( 6)     58.5 ( 6)
11/30/73   2200-2400       45.0 ( 6)     41.7 ( 6)     20.0 ( 6)     21.7 ( 6)
DAILY AVERAGE =            52.6          46.9          28.3          35.2
 (AVG ØF 2HR VALUES)
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HOUSE  -3   FALL-WINTER     NO2 AVERAGE CONCENTRATIONS , UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                   STATION
  DATE        TIME              1               1A              2                4
                            OVER STOVE 1M FROM STOVE LIV/    RM    OUTSIDE

12/ 1/73   0000-0200      50.0 ( 6)     41.7 ( 6)     18.3 ( 6)     21.7 ( 6)
12/ 1/73   0200-0400      43.3 ( 6)     40.0 ( 6)     18.3 ( 6)     20.0 ( 6)
12/ 1/73   0400-0600      38.3 ( 6)     40.0 ( 6)     16.7 ( 3)     20.0 ( 4)
12/ 1/73   0600-0800      45.0 ( 6)     41.7 ( 6)     17.5 ( 4)     17.5 ( 4)
12/ 1/73   0800-1000      48.3 ( 6)     45.0 ( 6)     20.0 ( 2)     17.5 ( 4)
12/ 1/73   1000-1200      61.7 ( 6)     43.3 ( 6)     13.3 ( 3)     18.3 ( 6)
12/ 1/73   1200-1400      71.7 ( 6)     53.3 ( 6)     16.7 ( 3)     16.0 ( 5)
12/ 1/73   1400-1600       ******        ******        ******        ******
12/ 1/73   1600-1800       ******        ******        ******        ******
12/ 1/73   1800-2000       ******        ******        ******        ******
12/ 1/73   2000-2200       ******        ******        ******        ******
12/ 1/73   2200-2400       ******        ******        ******        ******



12/ 2/73   0000-0200       ******        ******        ******        ******
12/ 2/73   0200-0400       ******        ******        ******        ******
12/ 2/73   0400-0600       ******        ******        ******        ******
12/ 2/73   0600-0800      73.3 ( 3)     36.7 ( 3)     15.0 ( 2)     20.0 ( 3)
12/ 2/73   0800-1000      66.7 ( 6)     46.7 ( 6)     14.0 ( 5)     20.0 ( 5)
12/ 2/73   1000-1200      73.3 ( 6)     55.0 ( 6)     12.5 ( 4)     15.0 ( 4)
12/ 2/73   1200-1400      70.0 ( 6)     58.3 ( 6)     13.3 ( 6)     18.3 ( 6)
12/ 2/73   1400-1600      76.7 ( 6)     58.3 ( 6)     18.3 ( 6)     28.3 ( 6)
12/ 2/73   1600-1800      63.3 ( 3)     56.7 ( 3)     36.7 ( 3)     60.0 ( 3)
12/ 2/73   1800-2000       ******        ******        ******        ******
12/ 2/73   2000-2200       ******        ******        ******        ******
12/ 2/73   2200-2400       ******        ******        ******        ******



12/ 3/73   0000-0200       ******        ******        ******        ******
12/ 3/73   0200-0400       ******        ******        ******        ******
12/ 3/73   0400-0600       ******        ******        ******        ******
12/ 3/73   0600-0800       ******        ******        ******        ******
12/ 3/73   0800-1000       ******        ******        ******        ******
12/ 3/73   1000-1200     100.3 ( 3)     46.7 ( 3)     53.3 ( 3)     46.7 ( 3)
12/ 3/73   1200-1400      81.7 ( 6)     43.3 ( 6)     70.0 ( 6)     41.7 ( 6)
12/ 3/73   1400-1600      95.3 ( 6)     50.0 ( 6)     61.7 ( 6)     53.3 ( 6)
12/ 3/73   1600-1800      80.0 ( 6)     40.0 ( 6)     60.0 ( 6)     76.7 ( 6)
12/ 3/73   1800-2000     277.7 ( 6)    162.3 ( 6)     58.3 ( 6)    130.5 ( 6)
12/ 3/73   2000-2200     112.2 ( 6)     63.5 ( 6)     90.2 ( 6)     71.8 ( 6)
12/ 3/73   2200-2400      73.3 ( 6)     43.3 ( 6)     46.7 ( 6)     50.0 ( 6)
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HOUSE  -3   FALL-WINTER     NO2 AVERAGE CONCENTRATIONS , UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
    MAX.: 6 PER 2HR,72 PER DAY

                                                 STATION
  DATE        TIME             1            1A             2              4
                           OVER STOVE 1M FROM STOVE LIV/   RM      OUTSIDE

12/ 4/73  0000-0200      45.0 ( 6)    45.0 ( 6)    36.7 ( 6)     56.7 ( 6)
12/ 4/73  0200-0400      53.3 ( 6)    51.7 ( 6)    45.0 ( 6)     41.7 ( 6)
12/ 4/73  0400-0600      46.7 ( 6)    48.3 ( 6)    40.0 ( 6)     46.7 ( 6)
12/ 4/73  0600-0800     132.3 ( 6)    88.7 ( 6)    51.7 ( 6)     73.3 ( 6)
12/ 4/73  0800-1000      81.8 ( 6)    76.7 ( 6)    90.3 ( 6)     95.2 ( 6)
12/ 4/73  1000-1200      83.5 ( 6)    68.3 ( 6)    98.7 ( 6)     91.7 ( 6)
12/ 4/73  1200-1400     107.2 ( 6)   108.5 ( 6)    97.2 ( 6)     93.7 ( 5)
12/ 4/73  1400-1600       ******       ******       ******        ******
12/ 4/73  1600-1800       ******       ******       ******        ******
12/ 4/73  1800-2000       ******       ******       ******        ******
12/ 4/73  2000-2200       ******       ******       ******        ******
12/ 4/73  2200-2400       ******       ******       ******        ******



12/ 5/73  0000-0200       ******       ******       ******        ******
12/ 5/73  0200-0400       ******       ******       ******        ******
12/ 5/73  0400-0600       ******       ******       ******        ******
12/ 5/73  0600-0800       ******       ******       ******        ******
12/ 5/73  0800-1000      65.0 ( 2)    70.0 ( 2)    85.5 ( 2)     60.0 ( 2)
12/ 5/73  1000-1200      61.7 ( 6)    63.3 ( 6)    55.0 ( 6)     51.7 ( 6)
12/ 5/73  1200-1400      65.0 ( 6)    61.7 ( 6)    48.3 ( 6)     41.7 ( 6)
12/ 5/73  1400-1600      60.0 ( 6)    60.0 ( 6)    45.0 ( 6)     36.7 ( 6)
12/ 5/73  1600-1800     314.8 ( 6)   210.8 ( 6)    83.7 ( 6)     78.8 ( 6)
12/ 5/73  1800-2000      82.2 ( 5)    60.0 ( 5)    56.0 ( 5)     32.0 ( 5)
12/ 5/73  2000-2200       ******       ******       ******        ******
12/ 5/73  2200-2400       ******       ******       ******        ******



12/11/73  0000-0200       ******       ******       ******        ******
12/11/73  0200-0400       ******       ******       ******        ******
12/11/73  0400-0600       ******       ******       ******        ******
12/11/73  0600-0800       ******       ******       ******        ******
12/11/73  0800-1000       ******       ******       ******        ******
12/11/73  1000-1200       ******       ******       ******        ******
12/11/73  1200-1400       ******       ******       ******        ******
12/11/73  1400-1600      74.0 ( 5)    60.0 ( 5)    36.0 ( 5)     38.0 ( 5)
12/11/73  1600-1800      50.0 ( 6)    50.0 ( 6)    31.7 ( 6)     36.7 ( 6)
12/11/73  1800-2000      56.7 ( 6)    53.3 ( 6)    43.3 ( 6)     38.3 ( 6)
12/11/73  2000-2200      68.3 ( 6)    48.3 ( 6)    46.7 ( 6)     35.0 ( 6)
12/11/73  2200-2400      58.3 ( 6)    48.3 ( 6)    28.3 ( 6)     25.0 ( 6)
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HOUSE  -3   FALL-WINTER      NO2 AVERAGE CONCENTRATIONS , UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                  STATION
   DATE         TIME          1              1A               3             4
                          OVER STOVE 1M FROM STOVE        /BD RM        OUTSIDE

 12/12/73   0000-0200       48.3 ( 6)    55.0 ( 6)    31.7 ( 6)    31.7 ( 6)
 12/12/73   0200-0400       63.3 ( 6)    51.7 ( 6)    43.3 ( 6)    31.7 ( 6)
 12/12/73   0400-0600       73.3 ( 6)    45.0 ( 6)    38.3 ( 6)    26.7 ( 6)
 12/12/73   0600-0800       61.7 ( 6)    48.3 ( 6)    30.0 ( 6)    43.3 ( 6)
 12/12/73   0800-1000       48.3 ( 6)    53.3 ( 6)    33.3 ( 6)    26.7 ( 6)
 12/12/73   1000-1200       28.3 ( 6)    40.0 ( 6)    20.0 ( 6)    16.7 ( 6)
 12/12/73   1200-1400       45.0 ( 2)    40.0 ( 2)    15.0 ( 2)    15.0 ( 2)
 12/12/73   1400-1600        ******       ******       ******       ******
 12/12/73   1600-1800        ******       ******       ******       ******
 12/12/73   1800-2000        ******       ******       ******       ******
 12/12/73   2000-2200        ******       ******       ******       ******
 12/12/73   2200-2400        ******       ******       ******       ******



 12/14/73   0000-0200        ******       ******       ******       ******
 12/14/73   0200-0400        ******       ******       ******       ******
 12/14/73   0400-0600        ******       ******       ******       ******
 12/14/73   0600-0800        ******       ******       ******       ******
 12/14/73   0800-1000        ******       ******       ******       ******
 12/14/73   1000-1200        ******       ******       ******       ******
 12/14/73   1200-1400        ******       ******       ******       ******
 12/14/73   1400-1600      395.3 ( 3)   351.7 ( 3)   314.7 ( 3)   100.3 ( 3)
 12/14/73   1600-1800      462.3 ( 6)   443.7 ( 6)   360.0 ( 6)   164.3 ( 6)
 12/14/73   1800-2000      296.3 ( 6)   212.7 ( 6)   142.5 ( 6)    98.5 ( 6)
 12/14/73   2000-2200      151.0 ( 6)    80.2 ( 6)    65.0 ( 6)    45.0 ( 6)
 12/14/73   2200-2400      179.3 ( 6)    75.0 ( 6)    65.0 ( 6)    33.3 ( 6)



 12/15/73   0000-0200      147.7 ( 6)    60.0 ( 6)    60.0 ( 6)    30.0 ( 6)
 12/15/73   0200-0400      147.7 ( 6)    61.7 ( 6)    60.0 ( 6)    33.3 ( 6)
 12/15/73   0400-0600      187.8 ( 6)   101.8 ( 6)    66.7 ( 6)    30.0 ( 6)
 12/15/73   0600-0800      141.0 ( 3)    63.3 ( 3)    60.0 ( 3)    23.3 ( 3)
 12/15/73   0800-1000      293.2 ( 6)   194.0 ( 6)   125.5 ( 6)    35.0 ( 6)
 12/15/73   1000-1200      174.3 ( 6)    70.0 ( 6)    66.7 ( 6)    38.5 ( 6)
 12/15/73   1200-1400      157.7 ( 6)    68.3 ( 6)    56.7 ( 6)    20.0 ( 6)
 12/15/73   1400-1600      141.0 ( 6)    85.0 ( 6)    50.0 ( 6)    20.0 ( 6)
 12/15/73   1600-1800      136.0 ( 6)    88.3 ( 6)    53.3 ( 6)    26.7 ( 6)
 12/15/73   1800-2000      120.8 ( 6)    88.3 ( 6)    56.7 ( 6)    31.7 ( 6)
 12/15/73   2000-2200      141.0 ( 6)    76.8 ( 6)    48.3 ( 6)    38.3 ( 6)
 12/15/73   2200-2400      144.3 ( 6)    88.7 ( 6)    51.7 ( 6)    38.3 ( 6)

 DAILY AVERAGE =           161.0         87.2         63.0         30.4
  (AVG OF 2HR VALUES)
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HOUSE  -3   FALL-WINTER     NO2 AVERAGE CONCENTRATIONS , UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                     STATION
  DATE         TIME             1               2               3                4
                           OVER STOVE 1M FROM STOVE          /BD RM         OUTSIDE

12/16/73   0000-0200      159.3 ( 6)      75.0 ( 6)      50.0 ( 6)      33.3 ( 6)
12/16/73   0200-0400      147.7 ( 6)      73.3 ( 6)      41.7 ( 6)      30.0 ( 6)
12/16/73   0400-0600      124.2 ( 6)      73.3 ( 6)      41.7 ( 6)      30.0 ( 6)
12/16/73   0600-0800      141.0 ( 6)      76.7 ( 6)      50.0 ( 6)      26.7 ( 6)
12/16/73   0800-1000      141.0 ( 6)      81.7 ( 6)      51.7 ( 6)      30.0 ( 6)
12/16/73   1000-1200      149.3 ( 6)      68.3 ( 6)      55.0 ( 6)      28.3 ( 6)
12/16/73   1200-1400      156.0 ( 6)      68.3 ( 6)      46.7 ( 6)      21.7 ( 6)
12/16/73   1400-1600      187.0 ( 5)     144.4 ( 5)      60.0 ( 5)      32.0 ( 5)
12/16/73   1600-1800      154.3 ( 6)      88.5 ( 6)      58.3 ( 6)      38.3 ( 6)
12/16/73   1800-2000      224.5 ( 6)     175.7 ( 6)     103.7 ( 6)      38.3 ( 6)
12/16/73   2000-2200      171.0 ( 6)     130.3 ( 6)      78.5 ( 6)      25.0 ( 6)
12/16/73   2200-2400      159.3 ( 6)      61.7 ( 6)      63.3 ( 6)      20.0 ( 6)

DAILY AVERAGE =           159.6           93.1           58.4           29.5
 (AVG OF 2HR VALUES)


12/22/73   0000-0200       ******         ******         ******         ******
12/22/73   0200-0400       ******         ******         ******         ******
12/22/73   0400-0600       ******         ******         ******         ******
12/22/73   0600-0800       ******         ******         ******         ******
12/22/73   0800-1000       ******         ******         ******         ******
12/22/73   1000-1200      104.0 ( 3)     472.3 ( 3)     207.3 ( 3)      33.3 ( 3)
12/22/73   1200-1400      132.5 ( 6)     130.8 ( 6)      60.0 ( 6)      33.3 ( 6)
12/22/73   1400-1600      127.5 ( 6)     206.0 ( 6)      71.8 ( 6)      35.0 ( 6)
12/22/73   1600-1800      156.0 ( 6)     157.7 ( 6)      70.0 ( 6)      36.7 ( 6)
12/22/73   1800-2000      382.0 ( 6)     398.5 ( 6)     147.3 ( 6)      33.3 ( 6)
12/22/73   2000-2200      162.7 ( 6)     162.7 ( 6)      61.7 ( 6)      20.0 ( 6)
12/22/73   2200-2400      214.5 ( 6)     164.2 ( 6)      71.7 ( 6)      35.0 ( 6)

DAILY AVERAGE =           182.7          241.7           98.5           32.4
 (AVG OF 2HR VALUES)
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HØUSE  -3   FALL-WINTER      NØ2 AVERAGE CØNCENTRATIØNS , UG/M3
  VALUES IN ( ) ARE NØ. ØF ØBSERVATIØNS IN PERIØD
     MAX.: 6 PER 2HR,72 PER DAY

                                                    STATIØN
  DATE        TIME              1              1A              3            4
                          ØVER STØVE  1M FRØM STØVE        /BD RM      ØUTSIDE

12/23/73  0000-0200      181.0 ( 6)   181.0 ( 6)     80.0 ( 6)    28.3 ( 6)
12/23/73  0200-0400      177.7 ( 6)   181.0 ( 6)     80.0 ( 6)    30.0 ( 6)
12/23/73  0400-0600      181.0 ( 6)   181.0 ( 6)     80.0 ( 6)    30.0 ( 6)
12/23/73  0600-0800      179.3 ( 6)   177.7 ( 6)     78.3 ( 6)    30.0 ( 6)
12/23/73  0800-1000      266.3 ( 6)   263.0 ( 6)    105.3 ( 6)    31.7 ( 6)
12/23/73  1000-1200      244.7 ( 6)   166.0 ( 6)     73.3 ( 6)    25.0 ( 6)
12/23/73  1200-1400      146.0 ( 6)   147.7 ( 6)     60.0 ( 6)    28.3 ( 6)
12/23/73  1400-1600      159.3 ( 6)   204.5 ( 6)     71.8 ( 6)    31.7 ( 6)
12/23/73  1600-1800      164.3 ( 6)   167.7 ( 6)     51.7 ( 6)    41.7 ( 6)
12/23/73  1800-2000      345.2 ( 6)   589.7 ( 6)    150.5 ( 6)    53.3 ( 6)
12/23/73  2000-2200      460.8 ( 6)   464.0 ( 6)    154.0 ( 6)    63.3 ( 6)
12/23/73  2200-2400      137.7 ( 6)   174.5 ( 6)     76.8 ( 6)    46.7 ( 6)

DAILY AVERAGE =          220.3        241.5          88.5         36.7
 (AVG ØF 2HR VALUES)
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HOUSE  -3   FALL-WINTER  NØ     AVERAGE CØNCENTRATIØNS , UG/M3
  VALUES IN ( ) ARE NØ. ØF ØBSERVATIØNS IN PERIØD
     MAX.: 6 PER 2HR,72 PER DAY

                                                STATIØN
  DATE         TIME            1            1A            2             4
                          ØVER STØVE 1M FRØM STØVE LIV/   RM     ØUTSIDE

11/28/73   0000-0200        ******       ******       ******       ******
11/28/73   0200-0400        ******       ******       ******       ******
11/28/73   0400-0600        ******       ******       ******       ******
11/28/73   0600-0800        ******       ******       ******       ******
11/28/73   0800-1000        ******       ******       ******       ******
11/28/73   1000-1200        ******       ******       ******       ******
11/28/73   1200-1400        ******       ******       ******       ******
11/28/73   1400-1600     216.5 ( 2)   216.5 ( 2)   163.5 ( 2)   190.0 ( 2)
11/28/73   1600-1800     321.0 ( 6)   243.7 ( 6)   220.5 ( 6)   245.5 ( 6)
11/28/73   1800-2000     431.3 ( 6)   338.8 ( 6)   310.3 ( 6)   123.5 ( 6)
11/28/73   2000-2200     384.3 ( 6)   270.8 ( 6)   206.5 ( 6)    16.3 ( 6)
11/28/73   2200-2400     233.2 ( 5)   179.4 ( 5)   183.4 ( 5)    18.0 ( 4)

                         317.3        249.8        216.8        118.7



11/29/73   0000-0200     162.2 ( 5)   101.0 ( 5)   106.2 ( 5)     ******
11/29/73   0200-0400     119.0 ( 6)    65.7 ( 6)    64.7 ( 6)     ******
11/29/73   0400-0600      96.3 ( 6)    42.3 ( 6)    41.3 ( 6)     ******
11/29/73   0600-0800      84.2 ( 6)    45.7 ( 6)    41.3 ( 6)     ******
11/29/73   0800-1000     131.3 ( 6)    50.2 ( 6)    28.3 ( 6)     ******
11/29/73   1000-1200       ******       ******       ******        ******
11/29/73   1200-1400       ******       ******       ******        ******
11/29/73   1400-1600      21.7 ( 3)    24.0 ( 3)     7.0 ( 1)     ******
11/29/73   1600-1800      59.0 ( 6)    20.7 ( 6)    10.8 ( 5)     ******
11/29/73   1800-2000     101.8 ( 6)    62.5 ( 6)    22.8 ( 6)     ******
11/29/73   2000-2200     174.8 ( 6)    96.3 ( 6)    36.2 ( 6)     ******
11/29/73   2200-2400     100.7 ( 6)    52.0 ( 6)    45.7 ( 6)     ******




11/30/73   0000-0200     250.2 ( 6)   297.4 ( 5)    18.0 ( 4)    59.0 ( 2)
11/30/73   0200-0400      76.7 ( 6)    52.0 ( 5)    20.0 ( 5)    13.0 ( 1)
11/30/73   0400-0600      70.8 ( 4)    50.5 ( 4)    13.0 ( 3)    16.5 ( 2)
11/30/73   0600-0800     153.0 ( 6)    70.8 ( 6)    41.7 ( 6)    28.8 ( 5)
11/30/73   0800-1000      82.0 ( 6)    68.8 ( 6)    58.8 ( 6)    19.7 ( 6)
11/30/73   1000-1200      81.0 ( 6)    73.3 ( 6)    32.5 ( 6)    12.0 ( 6)
11/30/73   1200-1400      71.2 ( 5)    60.4 ( 5)    21.0 ( 5)     8.2 ( 5)
11/30/73   1400-1600      75.5 ( 4)    64.3 ( 4)    31.0 ( 4)     8.5 ( 4)
11/30/73   1600-1800      87.7 ( 6)    72.5 ( 6)    35.2 ( 6)    59.2 ( 6)
11/30/73   1800-2000     126.8 ( 6)   115.7 ( 6)    85.3 ( 6)    96.2 ( 6)
11/30/73   2000-2200     169.0 ( 6)   147.3 ( 6)   124.3 ( 6)   120.8 ( 5)
11/30/73   2200-2400      86.3 ( 6)    62.2 ( 6)    21.8 ( 6)   *****  ( 4)

DAILY AVERAGE =          110.8         94.6         41.9         40.2
 (AVG ØF 2HR VALUES)
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```
HOUSE  -3   FALL-WINTER  NO      AVERAGE CONCENTRATIONS , UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                         STATION
   DATE        TIME             1             1A                3                 4
                            OVER STOVE 1M FROM STOVE LIV/   RM      OUTSIDE

12/ 1/73   0000-0200       62.5 ( 6)     43.5 ( 6)     11.0 ( 6)       ******
12/ 1/73   0200-0400       67.0 ( 6)     52.0 ( 6)     13.0 ( 6)       ******
12/ 1/73   0400-0600       54.7 ( 6)     36.8 ( 6)     10.0 ( 4)       ******
12/ 1/73   0600-0800       45.8 ( 6)     31.5 ( 6)    999.0 ( 6)       ******
12/ 1/73   0800-1000       41.3 ( 6)     26.0 ( 6)    999.0 ( 6)       ******
12/ 1/73   1000-1200       33.8 ( 6)     22.0 ( 6)    999.0 ( 6)       ******
12/ 1/73   1200-1400       39.2 ( 6)     26.0 ( 6)    999.0 ( 5)       ******
12/ 1/73   1400-1600        ******        ******        ******         ******
12/ 1/73   1600-1800        ******        ******        ******         ******
12/ 1/73   1800-2000        ******        ******        ******         ******
12/ 1/73   2000-2200        ******        ******        ******         ******
12/ 1/73   2200-2400        ******        ******        ******         ******



12/ 2/73   0000-0200        ******        ******        ******         ******
12/ 2/73   0200-0400        ******        ******        ******         ******
12/ 2/73   0400-0600        ******        ******        ******         ******
12/ 2/73   0600-0800       56.7 ( 3)     39.0 ( 3)      7.0 ( 2)
12/ 2/73   0800-1000       61.2 ( 6)     39.0 ( 6)      7.0 ( 6)      7.0 ( 2)
12/ 2/73   1000-1200       55.8 ( 6)     38.0 ( 6)      7.0 ( 2)      7.0 ( 1)
12/ 2/73   1200-1400       61.3 ( 6)     43.5 ( 6)      8.0 ( 5)      7.0 ( 6)
12/ 2/73   1400-1600       73.5 ( 6)     53.2 ( 6)     11.0 ( 6)      9.6 ( 5)
12/ 2/73   1600-1800       74.7 ( 3)     61.3 ( 3)     15.3 ( 3)     28.3 ( 3)
12/ 2/73   1800-2000        ******        ******        ******         ******
12/ 2/73   2000-2200        ******        ******        ******         ******
12/ 2/73   2200-2400        ******        ******        ******         ******



12/ 3/73   0000-0200        ******        ******        ******         ******
12/ 3/73   0200-0400        ******        ******        ******         ******
12/ 3/73   0400-0600        ******        ******        ******         ******
12/ 3/73   0600-0800        ******        ******        ******         ******
12/ 3/73   0800-1000        ******        ******        ******         ******
12/ 3/73   1000-1200      183.3 ( 3)    122.3 ( 3)    126.7 ( 3)     26.0 ( 3)
12/ 3/73   1200-1400      124.7 ( 6)     85.3 ( 6)     86.5 ( 6)     15.3 ( 6)
12/ 3/73   1400-1600      107.0 ( 6)     56.8 ( 6)     60.3 ( 6)     14.2 ( 6)
12/ 3/73   1600-1800       90.8 ( 6)     66.7 ( 6)     62.2 ( 6)     59.0 ( 6)
12/ 3/73   1800-2000      254.5 ( 6)    193.3 ( 6)    157.3 ( 6)    267.7 ( 6)
12/ 3/73   2000-2200      332.2 ( 6)    304.7 ( 6)    297.0 ( 6)    241.3 ( 6)
12/ 3/73   2200-2400      279.5 ( 6)    256.7 ( 6)    200.0 ( 6)    202.0 ( 6)
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HOUSE  -3   FALL-WINTER  NO      AVERAGE CONCENTRATIONS , UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                   STATION
   DATE         TIME                1                1A              3                4
                                 OVER STOVE 1M FROM STOVE LIV/    RM      OUTSIDE

12/ 4/73   0000-0200         278.5 ( 6)  276.2 ( 6)  250.2 ( 6)  268.5 ( 6)
12/ 4/73   0200-0400         292.5 ( 6)  291.5 ( 6)  249.0 ( 6)  227.0 ( 6)
12/ 4/73   0400-0600         280.5 ( 6)  279.5 ( 6)  223.0 ( 6)  226.3 ( 6)
12/ 4/73   0600-0800         376.8 ( 6)  353.8 ( 6)  314.7 ( 6)  376.7 ( 6)
12/ 4/73   0800-1000         358.2 ( 6)  359.2 ( 6)  267.7 ( 6)  169.2 ( 6)
12/ 4/73   1000-1200         246.7 ( 6)  226.2 ( 6)  149.3 ( 6)  112.5 ( 6)
12/ 4/73   1200-1400         173.7 ( 6)  130.2 ( 6)   74.2 ( 6)   27.2 ( 6)
12/ 4/73   1400-1600           ******      ******      ******      ******
12/ 4/73   1600-1800           ******      ******      ******      ******
12/ 4/73   1800-2000           ******      ******      ******      ******
12/ 4/73   2000-2200           ******      ******      ******      ******
12/ 4/73   2200-2400           ******      ******      ******      ******



12/ 5/73   0000-0200           ******      ******      ******      ******
12/ 5/73   0200-0400           ******      ******      ******      ******
12/ 5/73   0400-0600           ******      ******      ******      ******
12/ 5/73   0600-0800           ******      ******      ******      ******
12/ 5/73   0800-1000          45.5 ( 2)   52.5 ( 2)   85.5 ( 2)   23.0 ( 2)
12/ 5/73   1000-1200          94.2 ( 6)   80.0 ( 6)   67.0 ( 6)   24.0 ( 6)
12/ 5/73   1200-1400         116.6 ( 5)  105.0 ( 6)   67.0 ( 6)   27.2 ( 6)
12/ 5/73   1400-1600          98.3 ( 6)   87.3 ( 6)   66.0 ( 6)   26.0 ( 6)
12/ 5/73   1600-1800         277.5 ( 6)  147.7 ( 6)   98.5 ( 6)   24.0 ( 6)
12/ 5/73   1800-2000          82.8 ( 5)   56.4 ( 5)   56.2 ( 5)   23.6 ( 5)
12/ 5/73   2000-2200           ******      ******      ******      ******
12/ 5/73   2200-2400           ******      ******      ******      ******



12/11/73   0000-0200           ******      ******      ******      ******
12/11/73   0200-0400           ******      ******      ******      ******
12/11/73   0400-0600           ******      ******      ******      ******
12/11/73   0600-0800           ******      ******      ******      ******
12/11/73   0800-1000           ******      ******      ******      ******
12/11/73   1000-1200           ******      ******      ******      ******
12/11/73   1200-1400           ******      ******      ******      ******
12/11/73   1400-1600          59.0 ( 5)   52.0 ( 5)   28.6 ( 5)   20.0 ( 5)
12/11/73   1600-1800          43.7 ( 6)   38.0 ( 6)   24.2 ( 6)   17.3 ( 6)
12/11/73   1800-2000          43.5 ( 6)   33.7 ( 6)   21.7 ( 6)    8.0 ( 6)
12/11/73   2000-2200          50.0 ( 6)   48.0 ( 6)   27.2 ( 6)    9.0 ( 6)
12/11/73   2200-2400          53.5 ( 6)   44.5 ( 6)   27.3 ( 6)    7.0 ( 6)
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HOUSE  -3   FALL-WINTER  NO      AVERAGE CONCENTRATIONS , UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                   STATION
  DATE          TIME            1            1A              3                4
                         OVER STOVE 1M FROM STOVE LIV/BD RM        OUTSIDE

12/12/73   0000-0200      44.5 ( 6)    39.0 ( 6)    26.0 ( 6)    10.0 ( 6)
12/12/73   0200-0400      55.7 ( 6)    42.5 ( 6)    26.0 ( 6)    15.8 ( 5)
12/12/73   0400-0600      50.0 ( 6)    39.0 ( 6)    25.0 ( 6)    13.2 ( 6)
12/12/73   0600-0800      71.2 ( 6)    66.7 ( 6)    51.3 ( 6)    64.5 ( 6)
12/12/73   0800-1000      67.7 ( 6)    68.8 ( 6)    42.7 ( 6)    13.0 ( 6)
12/12/73   1000-1200      11.5 ( 4)    13.0 ( 6)     7.0 ( 4)     7.0 ( 6)
12/12/73   1200-1400      19.5 ( 2)    13.0 ( 2)   999.0 ( 6)     7.0 ( 2)
12/12/73   1400-1600       ******       ******       ******       ******
12/12/73   1600-1800       ******       ******       ******       ******
12/12/73   1800-2000       ******       ******       ******       ******
12/12/73   2000-2200       ******       ******       ******       ******
12/12/73   2200-2400       ******       ******       ******       ******




12/14/73   0000-0200       ******       ******       ******       ******
12/14/73   0200-0400       ******       ******       ******       ******
12/14/73   0400-0600       ******       ******       ******       ******
12/14/73   0600-0800       ******       ******       ******       ******
12/14/73   0800-1000       ******       ******       ******       ******
12/14/73   1000-1200       ******       ******       ******       ******
12/14/73   1200-1400       ******       ******       ******       ******
12/14/73   1400-1600     168.0 ( 3)   194.7 ( 3)   135.3 ( 3)    91.3 ( 3)
12/14/73   1600-1800     315.7 ( 6)   321.2 ( 6)   257.7 ( 6)    38.0 ( 6)
12/14/73   1800-2000     142.0 ( 6)   122.2 ( 6)   108.3 ( 6)    32.7 ( 6)
12/14/73   2000-2200      83.2 ( 6)    67.0 ( 6)    53.5 ( 6)    26.2 ( 6)
12/14/73   2200-2400     130.2 ( 6)    90.8 ( 6)    88.7 ( 6)    32.7 ( 6)




12/15/73   0000-0200      88.5 ( 6)    61.3 ( 6)    63.7 ( 6)    26.0 ( 6)
12/15/73   0200-0400      79.0 ( 6)    53.2 ( 6)    52.0 ( 6)    23.0 ( 6)
12/15/73   0400-0600     123.3 ( 6)    68.7 ( 6)    64.2 ( 6)    18.8 ( 6)
12/15/73   0600-0800     100.3 ( 3)    79.0 ( 3)    79.0 ( 3)    15.3 ( 3)
12/15/73   0800-1000     171.5 ( 6)   143.2 ( 6)   115.7 ( 6)    20.8 ( 6)
12/15/73   1000-1200     106.0 ( 6)    72.3 ( 6)    77.8 ( 6)    15.3 ( 6)
12/15/73   1200-1400      78.7 ( 6)    54.7 ( 6)    52.7 ( 6)    13.0 ( 6)
12/15/73   1400-1600      67.0 ( 6)    51.2 ( 6)    33.7 ( 6)    13.0 ( 6)
12/15/73   1600-1800      65.7 ( 6)    50.0 ( 6)    32.7 ( 6)    13.0 ( 6)
12/15/73   1800-2000      68.0 ( 6)    51.3 ( 6)    35.8 ( 6)    17.5 ( 6)
12/15/73   2000-2200      75.7 ( 6)    48.8 ( 6)    34.8 ( 6)    19.7 ( 6)
12/15/73   2200-2400      85.2 ( 6)    64.5 ( 6)    40.2 ( 6)    26.0 ( 6)

DAILY AVERAGE =           92.4         66.5         56.8         18.5
 (AVG OF 2HR VALUES)
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HOUSE  -3   FALL-WINTER  NO      AVERAGE CONCENTRATIONS , UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                      STATION
   DATE         TIME             1                 1A                 3                4
                             OVER STOVE 1M FROM STOVE          /BD RM         OUTSIDE

12/16/73   0000-0200          90•8 ( 6)      69•2 ( 6)      52•0 ( 6)      26•0 ( 6)
12/16/73   0200-0400          92•0 ( 6)      68•0 ( 6)      52•0 ( 6)      26•0 ( 6)
12/16/73   0400-0600          90•8 ( 6)      65•7 ( 6)      52•0 ( 6)      26•0 ( 6)
12/16/73   0600-0800          90•8 ( 6)      66•8 ( 6)      52•0 ( 6)      26•0 ( 6)
12/16/73   0800-1000          90•8 ( 6)      65•5 ( 6)      52•0 ( 6)      26•0 ( 6)
12/16/73   1000-1200          87•5 ( 6)      57•7 ( 6)      52•0 ( 6)      23•0 ( 6)
12/16/73   1200-1400          83•2 ( 6)      55•7 ( 6)      48•8 ( 6)      19•7 ( 6)
12/16/73   1400-1600         105•2 ( 5)      83•8 ( 5)      41•8 ( 5)      18•4 ( 5)
12/16/73   1600-1800          79•0 ( 6)      56•8 ( 6)      39•0 ( 6)      17•3 ( 6)
12/16/73   1800-2000         156•2 ( 6)     150•8 ( 6)     101•8 ( 6)      24•0 ( 6)
12/16/73   2000-2200         102•8 ( 6)     120•3 ( 6)      85•3 ( 6)      12•0 ( 6)
12/16/73   2200-2400          90•8 ( 6)      64•3 ( 6)      66•7 ( 6)      12•0 ( 6)

DAILY AVERAGE =               96•7           77•1           58•0           21•4
 (AVG OF 2HR VALUES)

12/22/73   0000-0200           ******         ******         ******         ******
12/22/73   0200-0400           ******         ******         ******         ******
12/22/73   0400-0600           ******         ******         ******         ******
12/22/73   0600-0800           ******         ******         ******         ******
12/22/73   0800-1000           ******         ******         ******         ******
12/22/73   1000-1200         484•7 ( 3)     382.0   ( 3)   242.3 ( 3)    150.7   ( 3)
12/22/73   1200-1400          98•0 ( 6)      42.7   ( 6)    91.7 ( 6)     90.5   ( 6)
12/22/73   1400-1600          52•5 ( 6)      26.2   ( 6)   118.0 ( 6)     61.0   ( 6)
12/22/73   1600-1800          52•5 ( 6)      14.2   ( 6)    54.7 ( 6)     53.2   ( 6)
12/22/73   1800-2000         171•5 ( 6)      17.5   ( 6)   206.3 ( 6)    123.5   ( 6)
12/22/73   2000-2200          86•5 ( 6)      15.2   ( 6)    90.8 ( 6)     64.5   ( 6)
12/22/73   2200-2400          86•5 ( 6)      25.0   ( 6)    76.7 ( 6)     43.5   ( 6)
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HOUSE  -3   FALL-WINTER  NO      AVERAGE CONCENTRATIONS , UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                      STATION
   DATE        TIME              1               1A                3                 4
                          OVER STOVE 1M FROM STOVE         /BD RM         OUTSIDE

12/23/73   0000-0200       89.7 ( 6)      91.8 ( 6)      65.8 ( 6)      18.8 ( 6)
12/23/73   0200-0400       96.0 ( 6)     103.8 ( 6)      75.5 ( 6)      17.7 ( 6)
12/23/73   0400-0600       99.3 ( 6)     101.5 ( 6)      75.5 ( 6)      16.5 ( 6)
12/23/73   0600-0800       94.0 ( 6)      99.3 ( 6)      66.0 ( 6)      13.0 ( 6)
12/23/73   0800-1000      130.0 ( 6)     122.3 ( 6)      66.8 ( 6)      16.5 ( 6)
12/23/73   1000-1200      141.0 ( 6)      87.5 ( 6)      55.5 ( 6)      13.0 ( 6)
12/23/73   1200-1400       59.0 ( 6)      63.7 ( 6)      29.3 ( 6)      13.0 ( 6)
12/23/73   1400-1600       64.5 ( 6)     124.5 ( 6)      40.3 ( 6)      12.0 ( 6)
12/23/73   1600-1800       52.2 ( 6)      49.8 ( 6)      15.3 ( 6)       8.0 ( 6)
12/23/73   1800-2000      404.0 ( 6)     468.3 ( 6)     161.8 ( 6)      27.2 ( 6)
12/23/73   2000-2200      397.5 ( 6)     438.0 ( 6)     202.0 ( 6)      63.2 ( 6)
12/23/73   2200-2400       97.3 ( 6)     139.8 ( 6)      82.2 ( 6)      22.8 ( 6)

DAILY AVERAGE =           143.7          157.5           78.0           20.1
 (AVG OF 2HR VALUES)


12/24/73   0000-0200       90.7 ( 6)      93.0 ( 6)      62.3 ( 6)      14.2 ( 6)
12/24/73   0200-0400       96.3 ( 6)      99.3 ( 6)      67.0 ( 6)      24.0 ( 6)
12/24/73   0400-0600       95.2 ( 6)      97.2 ( 6)      67.0 ( 6)      24.0 ( 6)
12/24/73   0600-0800       93.0 ( 6)      93.0 ( 6)      64.8 ( 6)      17.5 ( 6)
12/24/73   0800-1000       83.2 ( 6)      87.5 ( 6)      57.8 ( 6)      18.8 ( 6)
12/24/73   1000-1200      133.3 ( 6)     141.8 ( 6)      92.8 ( 6)      26.0 ( 6)
12/24/73   1200-1400        *******         *******        *******         *******
12/24/73   1400-1600        *******         *******        *******         *******
12/24/73   1600-1800        *******         *******        *******         *******
12/24/73   1800-2000        *******         *******        *******         *******
12/24/73   2000-2200        *******         *******        *******         *******
12/24/73   2200-2400        *******         *******        *******         *******
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HOUSE  3   FALL-WINTER    CO AVERAGE CONCENTRATIONS ,UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                STATION
  DATE        TIME             1            1A            2             4
                          OVER STOVE 1M FROM STOVE LIV     RM      OUTSIDE

11/28/73  0000-0200         ******        ******        ******        ******
11/28/73  0200-0400         ******        ******        ******        ******
11/28/73  0400-0600         ******        ******        ******        ******
11/28/73  0600-0800         ******        ******        ******        ******
11/28/73  0800-1000         ******        ******        ******        ******
11/28/73  1000-1200       10341. ( 3)   7876. ( 3)   7602. ( 3)   4315. ( 3)
11/28/73  1200-1400       10549. ( 6)   7775. ( 6)   7844. ( 6)   4385. ( 6)
11/28/73  1400-1600       10849. ( 5)   8354. ( 5)   8354. ( 5)   5684. ( 5)
11/28/73  1600-1800       11133. ( 4)   9163. ( 4)   8178. ( 4)   7194. ( 4)
11/28/73  1800-2000       28074. ( 2)  26870. ( 2)  22493. ( 2)   3890. ( 2)
11/28/73  2000-2200       22073. ( 6)  19373. ( 6)  15033. ( 6)   3324. ( 6)
11/28/73  2200-2400       12060. ( 6)  10659. ( 5)   8003. ( 5)   1835. ( 5)



11/29/73  0000-0200        9565. ( 6)   7852. ( 6)   5246. ( 6)   1426. ( 6)
11/29/73  0200-0400        7892. ( 6)   6000. ( 6)   3679. ( 6)   1573. ( 6)
11/29/73  0400-0600        6897. ( 6)   5361. ( 6)   3077. ( 6)   1684. ( 6)
11/29/73  0600-0800        6355. ( 3)   4712. ( 3)   2928. ( 3)   2142. ( 3)
11/29/73  0800-1000        6176. ( 6)   4820. ( 6)   3249. ( 6)   1678. ( 6)
11/29/73  1000-1200        3933. ( 5)   2562. ( 5)   2605. ( 5)   1791. ( 5)
11/29/73  1200-1400        4674. ( 6)   2782. ( 6)   2925. ( 6)   1354. ( 6)
11/29/73  1400-1600        5090. ( 6)   3213. ( 5)   3339. ( 5)   2081. ( 5)
11/29/73  1600-1800        5519. ( 5)   3673. ( 5)   3547. ( 5)   2247. ( 5)
11/29/73  1800-2000       10178. ( 5)   8230. ( 5)   7158. ( 5)   1998. ( 5)
11/29/73  2000-2200        8929. ( 6)   9279. ( 6)   5993. ( 6)   2602. ( 6)
11/29/73  2200-2400        7230. ( 6)   5781. ( 5)   3894. ( 5)   1713. ( 5)

DAILY AVERAGE =            6870.        5360.        3970.        1857.
 (AVG OF 2HR VALUES)


11/30/73  0000-0200        7254. ( 6)   5227. ( 6)   4283. ( 6)   2046. ( 6)
11/30/73  0200-0400        7526. ( 3)   5359. ( 3)   4171. ( 3)   1863. ( 3)
11/30/73  0400-0600        7032. ( 3)   5214. ( 3)   3746. ( 3)   2068. ( 3)
11/30/73  0600-0800        8523. ( 6)   8382. ( 5)   4481. ( 5)   2719. ( 5)
11/30/73  0800-1000        7918. ( 6)   5471. ( 6)   5087. ( 6)   2500. ( 6)
11/30/73  1000-1200        7558. ( 6)   5216. ( 6)   5006. ( 6)   2210. ( 6)
11/30/73  1200-1400        7128. ( 6)   4716. ( 6)   4332. ( 6)   2235. ( 6)
11/30/73  1400-1600         ******        ******        ******        ******
11/30/73  1600-1800         ******        ******        ******        ******
11/30/73  1800-2000         ******        ******        ******        ******
11/30/73  2000-2200         ******        ******        ******        ******
11/30/73  2200-2400         ******        ******        ******        ******
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HØUSE  3   FALL-WINTER    CØ AVERAGE CØNCENTRATIØNS ,UG/M3
  VALUFS IN ( ) ARE NØ. ØF ØBSERVATIØNS IN PERIØD
     MAX.: 6 PER 2HR,72 PER DAY

                                                  STATIØN
  DATE        TIME             1            1A              2              4
                         ØVER STØVE  1M FRØM STØVE LIV      RM      ØUTSIDE

12/ 3/73  0000-0200        ******       ******       ******       ******
12/ 3/73  0200-0400        ******       ******       ******       ******
12/ 3/73  0400-0600        ******       ******       ******       ******
12/ 3/73  0600-0800        ******       ******       ******       ******
12/ 3/73  0800-1000        ******       ******       ******       ******
12/ 3/73  1000-1200    10935. ( 3)   9673. ( 3)   7879. ( 3)   2429. ( 3)
12/ 3/73  1200-1400     8926. ( 6)   7830. ( 6)   5769. ( 6)   2613. ( 6)
12/ 3/73  1400-1600     7443. ( 6)   6238. ( 5)   4540. ( 5)   2843. ( 5)
12/ 3/73  1600-1800     7469. ( 6)   5790. ( 6)   4145. ( 6)   3290. ( 6)
12/ 3/73  1800-2000     7732. ( 6)   6317. ( 6)   5198. ( 6)   6317. ( 6)
12/ 3/73  2000-2200    14015. ( 3)  12765. ( 3)  10265. ( 3)   6712. ( 3)
12/ 3/73  2200-2400    12271. ( 6)  10468. ( 5)   9542. ( 5)   5918. ( 5)



12/ 4/73  0000-0200    12171. ( 6)  10157. ( 6)   9486. ( 6)   7405. ( 6)
12/ 4/73  0200-0400    12261. ( 6)  10147. ( 6)  10046. ( 6)   6590. ( 6)
12/ 4/73  0400-0600    11949. ( 6)   9801. ( 6)   9600. ( 6)   5640. ( 6)
12/ 4/73  0600-0800    11338. ( 3)   9051. ( 2)   8847. ( 2)   7525. ( 2)
12/ 4/73  0800-1000    17251. ( 6)  15498. ( 6)  15013. ( 6)   7963. ( 6)
12/ 4/73  1000-1200    12703. ( 6)  10568. ( 6)  10127. ( 6)   4975. ( 6)
12/ 4/73  1200-1400    12190. ( 5)  10237. ( 5)   9058. ( 5)   3892. ( 5)
12/ 4/73  1400-1600     6740. ( 2)   4785. ( 1)   4186. ( 1)   3190. ( 1)
12/ 4/73  1600-1800        ******       ******       ******       ******
12/ 4/73  1800-2000        ******       ******       ******       ******
12/ 4/73  2000-2200        ******       ******       ******       ******
12/ 4/73  2200-2400    12000. ( 5)  10470. ( 5)   8779. ( 5)   5557. ( 5)



12/ 5/73  0000-0200     9631. ( 6)   8255. ( 6)   5940. ( 6)   2953. ( 6)
12/ 5/73  0200-0400     8020. ( 6)   6510. ( 6)   4564. ( 6)   2483. ( 6)
12/ 5/73  0400-0600     7350. ( 6)   5738. ( 6)   4128. ( 6)   2685. ( 6)
12/ 5/73  0600-0800     7058. ( 6)   5600. ( 5)   4179. ( 5)   3784. ( 5)
12/ 5/73  0800-1000     7502. ( 6)   6087. ( 6)   5462. ( 6)   4541. ( 6)
12/ 5/73  1000-1200     6222. ( 6)   4347. ( 6)   4577. ( 6)   2768. ( 6)
12/ 5/73  1200-1400     7311. ( 6)   5535. ( 6)   5206. ( 6)   2640. ( 6)
12/ 5/73  1400-1600     6801. ( 6)   4752. ( 5)   4027. ( 5)   1450. ( 5)
12/ 5/73  1600-1800     5477. ( 5)   3262. ( 5)   2497. ( 5)    725. ( 5)
12/ 5/73  1800-2000        ******       ******       ******       ******
12/ 5/73  2000-2200        ******       ******       ******       ******
12/ 5/73  2200-2400        ******       ******       ******       ******
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HOUSE  3   FALL-WINTER    CO AVERAGE CONCENTRATIONS ,UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
    MAX.: 6 PER 2HR,72 PER DAY

                                                    STATION
   DATE         TIME            1             1A              2                4
                           OVER STOVE 1M FROM STOVE LIV      RM      OUTSIDE

12/ 6/73   0000-0200         ******        ******        ******        ******
12/ 6/73   0200-0400         ******        ******        ******        ******
12/ 6/73   0400-0600         ******        ******        ******        ******
12/ 6/73   0600-0800         ******        ******        ******        ******
12/ 6/73   0800-1000         ******        ******        ******        ******
12/ 6/73   1000-1200       4866. ( 6)    2853. ( 6)    3255. ( 6)    1980. ( 6)
12/ 6/73   1200-1400       5101. ( 6)    2953. ( 6)    2685. ( 6)    1846. ( 6)
12/ 6/73   1400-1600       4671. ( 5)    3322. ( 4)    2618. ( 5)    2013. ( 5)
12/ 6/73   1600-1800       5134. ( 6)    3759. ( 6)    2483. ( 6)    1745. ( 6)
12/ 6/73   1800-2000       5470. ( 6)    3994. ( 6)    3222. ( 6)    1879. ( 6)
12/ 6/73   2000-2200       6362. ( 5)    5336. ( 6)    3826. ( 6)    2987. ( 6)
12/ 6/73   2200-2400       7048. ( 6)    5453. ( 5)    4417. ( 5)    3141. ( 5)



12/ 7/73   0000-0200       6442. ( 6)    5213. ( 6)    4117. ( 6)    3020. ( 6)
12/ 7/73   0200-0400       6147. ( 6)    4187. ( 6)    4154. ( 6)    3131. ( 3)
12/ 7/73   0400-0600       5819. ( 6)    4092. ( 6)    3925. ( 6)    3128. ( 6)
12/ 7/73   0600-0800       6913. ( 6)    5201. ( 5)    5240. ( 5)    7586. ( 4)
12/ 7/73   0800-1000      11210. ( 3)   10076. ( 4)    8399. ( 4)    6227. ( 4)
12/ 7/73   1000-1200       7875. ( 6)    6512. ( 6)    4552. ( 6)    4087. ( 6)
12/ 7/73   1200-1400       7011. ( 6)    6213. ( 6)    4718. ( 6)    3854. ( 6)
12/ 7/73   1400-1600       5823. ( 6)    3652. ( 6)    3040. ( 5)    2527. ( 5)
12/ 7/73   1600-1800       5494. ( 6)    4277. ( 6)    2863. ( 6)    2665. ( 6)
12/ 7/73   1800-2000       6810. ( 6)    5461. ( 6)    3948. ( 6)    2369. ( 6)
12/ 7/73   2000-2200       7238. ( 6)    6120. ( 6)    4739. ( 6)    4178. ( 6)
12/ 7/73   2200-2400       9004. ( 6)    8992. ( 5)    7261. ( 5)    6415. ( 5)

DAILY AVERAGE =            7149.         5833.         4746.         4099.
 (AVG OF 2HR VALUES)

12/ 8/73   0000-0200       8941. ( 6)    7431. ( 6)    5719. ( 6)    2095. ( 6)
12/ 8/73   0200-0400       6294. ( 6)    5086. ( 6)    3341. ( 6)    1495. ( 6)
12/ 8/73   0400-0600       5324. ( 6)    4116. ( 6)    2472. ( 6)    1566. ( 6)
12/ 8/73   0600-0800       5063. ( 6)    3780. ( 5)    2572. ( 5)    1847. ( 5)
12/ 8/73   0800-1000       7134. ( 6)    5724. ( 6)    3979. ( 6)    2100. ( 6)
12/ 8/73   1000-1200       5681. ( 6)    4003. ( 6)    4103. ( 6)    2560. ( 6)
12/ 8/73   1200-1400       6476. ( 6)    4596. ( 6)    4462. ( 6)    2952. ( 6)
12/ 8/73   1400-1600       7522. ( 6)    9066. ( 5)    6697. ( 5)    2946. ( 5)
12/ 8/73   1600-1800      10124. ( 6)    8973. ( 6)    6275. ( 6)    3610. ( 6)
12/ 8/73   1800-2000       8384. ( 6)    7397. ( 6)    5587. ( 6)    4337. ( 6)
12/ 8/73   2000-2200       8025. ( 6)    6775. ( 6)    5591. ( 6)    4110. ( 6)
12/ 8/73   2200-2400       6568. ( 6)    5157. ( 5)    4051. ( 5)    2354. ( 5)

DAILY AVERAGE =            7128.         6009.         4571.         2664.
 (AVG OF 2HR VALUES)
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HOUSE  3   FALL-WINTER    CO AVERAGE CONCENTRATIONS ,UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                     STATION
    DATE         TIME              1                1A             2               4
                             OVER STOVE 1M FROM STOVE LIV     RM      OUTSIDE

 12/ 9/73   0000-0200       6373. ( 6)  4959. ( 6)  3610. ( 6)  2327. ( 6)
 12/ 9/73   0200-0400       6311. ( 6)  4962. ( 6)  3515. ( 6)  2561. ( 6)
 12/ 9/73   0400-0600       6545. ( 6)  5163. ( 6)  3715. ( 6)  2794. ( 6)
 12/ 9/73   0600-0800       5559. ( 6)  4130. ( 5)  2722. ( 5)  2018. ( 5)
 12/ 9/73   0800-1000       6057. ( 6)  4721. ( 6)  3581. ( 6)  2702. ( 6)
 12/ 9/73   1000-1200       8086. ( 6)  7272. ( 6)  5773. ( 6)  3981. ( 6)
 12/ 9/73   1200-1400      13048. ( 6) 11973. ( 6)  9008. ( 6)  6662. ( 6)
 12/ 9/73   1400-1600      17412. ( 6) 15158. ( 5) 11625. ( 5)  4521. ( 5)
 12/ 9/73   1600-1800       8896. ( 6)  7123. ( 6)  5952. ( 6)  4432. ( 6)
 12/ 9/73   1800-2000       7978. ( 6)  7535. ( 6)  5604. ( 6)  3007. ( 6)
 12/ 9/73   2000-2200       6522. ( 6)  5002. ( 6)  3957. ( 6)  2469. ( 6)
 12/ 9/73   2200-2400       7259. ( 6)  5930. ( 6)  5026. ( 5)  1949. ( 5)

DAILY AVERAGE =             8337.       6994.       5341.       3285.
 (AVG OF 2HR VALUES)


 12/10/73   0000-0200       8213. ( 6)  6282. ( 6)  4984. ( 6)  2166. ( 6)
 12/10/73   0200-0400       6919. ( 6)  4608. ( 6)  3658. ( 6)  1980. ( 6)
 12/10/73   0400-0600       6353. ( 6)  4643. ( 6)  3092. ( 6)  1635. ( 6)
 12/10/73   0600-0800       6410. ( 6)  4671. ( 5)  3101. ( 5)  2497. ( 5)
 12/10/73   0800-1000       6275. ( 6)  4933. ( 6)  4094. ( 6)  2450. ( 6)
 12/10/73   1000-1200       6889. ( 4)  4798. ( 4)  4658. ( 4)  1781. ( 4)
 12/10/73   1200-1400       7274. ( 6)  4935. ( 6)  3602. ( 6)  2083. ( 6)
 12/10/73   1400-1600       5852. ( 6)  4860. ( 5)  3720. ( 5)  2315. ( 5)
 12/10/73   1600-1800       7207. ( 6)  6193. ( 6)  4072. ( 6)  5244. ( 6)
 12/10/73   1800-2000      15365. ( 6) 13940. ( 6) 10489. ( 6)  8716. ( 6)
 12/10/73   2000-2200      15735. ( 6) 14089. ( 6) 12981. ( 6) 13044. ( 6)
 12/10/73   2200-2400      17768. ( 6) 16398. ( 5) 15508. ( 5) 15120. ( 5)

DAILY AVERAGE =             9188.       7534.       6163.       4919.
 (AVG OF 2HR VALUES)


 12/11/73   0000-0200      17828. ( 6) 16182. ( 6) 14504. ( 6) 11245. ( 6)
 12/11/73   0200-0400      14311. ( 6) 12697. ( 6) 10471. ( 6)  5889. ( 6)
 12/11/73   0400-0600       9600. ( 6)  7986. ( 6)  5953. ( 6)  2694. ( 6)
 12/11/73   0600-0800       7274. ( 6)  5737. ( 5)  4369. ( 5)  3989. ( 5)
 12/11/73   0800-1000      10068. ( 6)  8136. ( 6)  6237. ( 6)  4464. ( 6)
 12/11/73   1000-1200       8073. ( 6)  6522. ( 6)  4907. ( 6)  2722. ( 6)
 12/11/73   1200-1400       6711. ( 6)  5161. ( 6)  3514. ( 6)  2343. ( 6)
 12/11/73   1400-1600       5756. ( 6)  4956. ( 5)  4621. ( 5)  2383. ( 5)
 12/11/73   1600-1800       5178. ( 6)  3872. ( 6)  3531. ( 6)  1946. ( 6)
 12/11/73   1800-2000       3459. ( 6)  2248. ( 6)  1781. ( 6)   756. ( 6)
 12/11/73   2000-2200       4600. ( 6)  4009. ( 6)  3512. ( 6)  1213. ( 6)
 12/11/73   2200-2400       5763. ( 6)  4101. ( 6)  4360. ( 5)  1663. ( 5)

DAILY AVERAGE =             8218.       6801.       5647.       3442.
 (AVG OF 2HR VALUES)
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HOUSE  3   FALL-WINTER    CO AVERAGE CONCENTRATIONS ,UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                 STATION
   DATE        TIME            1            1A               3              4
                          OVER STOVE 1M FROM STOVE       BD RM        OUTSIDE

12/12/73   0000-0200       4936. ( 6)  3954. ( 6)  3353. ( 6)  1390. ( 6)
12/12/73   0200-0400       4939. ( 6)  3895. ( 6)  3483. ( 6)  1837. ( 6)
12/12/73   0400-0600       5260. ( 6)  4310. ( 6)  3708. ( 6)  1936. ( 6)
12/12/73   0600-0800       5739. ( 6)  4187. ( 6)  4642. ( 5)  4338. ( 5)
12/12/73   0800-1000      10016. ( 6)  7705. ( 6)  7040. ( 6)  3083. ( 6)
12/12/73   1000-1200       6063. ( 6)  4131. ( 6)  4606. ( 6)  2833. ( 6)
12/12/73   1200-1400       5574. ( 5)  3827. ( 5)  3743. ( 4)  2841. ( 4)
12/12/73   1400-1600         ******      ******      ******      ******
12/12/73   1600-1800         ******      ******      ******      ******
12/12/73   1800-2000         ******      ******      ******      ******
12/12/73   2000-2200         ******      ******      ******      ******
12/12/73   2200-2400         ******      ******      ******      ******



12/13/73   0000-0200         ******      ******      ******      ******
12/13/73   0200-0400         ******      ******      ******      ******
12/13/73   0400-0600         ******      ******      ******      ******
12/13/73   0600-0800         ******      ******      ******      ******
12/13/73   0800-1000         ******      ******      ******      ******
12/13/73   1000-1200         ******      ******      ******      ******
12/13/73   1200-1400         ******      ******      ******      ******
12/13/73   1400-1600      12514. ( 5) 17212. ( 5) 10986. ( 5)  3752. ( 5)
12/13/73   1600-1800      20903. ( 6) 18293. ( 6) 14005. ( 6)  3099. ( 6)
12/13/73   1800-2000      13655. ( 5) 13058. ( 5) 12020. ( 6)  2884. ( 6)
12/13/73   2000-2200      13079. ( 6) 12831. ( 6)  9941. ( 6)  2856. ( 6)
12/13/73   2200-2400      11763. ( 5) 10547. ( 5)  9939. ( 5)  2018. ( 6)



12/14/73   0000-0200       9616. ( 6)  7747. ( 6)  7937. ( 6)  2239. ( 6)
12/14/73   0200-0400       8764. ( 6)  6833. ( 6)  6959. ( 6)  2432. ( 6)
12/14/73   0400-0600       8514. ( 6)  6741. ( 6)  6867. ( 6)  2657. ( 6)
12/14/73   0600-0800       3031. ( 5)  6315. ( 5)  6539. ( 5)  2239. ( 6)
12/14/73   0800-1000       9187. ( 5)  7732. ( 5)  8180. ( 5)  2773. ( 5)
12/14/73   1000-1200       7164. ( 5)  6045. ( 5)  7539. ( 6)  3717. ( 6)
12/14/73   1200-1400      10249. ( 5)  9802. ( 5)  8176. ( 6)  3546. ( 6)
12/14/73   1400-1600      10521. ( 5) 10263. ( 5)  6679. ( 5)  2586. ( 6)
12/14/73   1600-1800       9541. ( 6)  9449. ( 6)  7540. ( 6)  2737. ( 6)
12/14/73   1800-2000      10930. ( 4)  7482. ( 6)  6343. ( 6)  2094. ( 6)
12/14/73   2000-2200       5977. ( 6)  4099. ( 6)  3853. ( 6)  1513. ( 6)
12/14/73   2200-2400       7832. ( 5)  5246. ( 5)  5246. ( 5)  1850. ( 6)

DAILY AVERAGE =            8860.       7313.       6821.       2532.
 (AVG OF 2HR VALUES)
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HOUSE  3   FALL-WINTER    CO AVERAGE CONCENTRATIONS ,UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                STATION
   DATE         TIME              1               1A               3               4
                            OVER STOVE 1M FROM STOVE           BD RM         OUTSIDE

12/15/73   0000-0200        7112. ( 6)   4187. ( 6)   4279. ( 6)   1693. ( 6)
12/15/73   0200-0400        6527. ( 6)   3756. ( 6)   3725. ( 6)   1663. ( 6)
12/15/73   0400-0600        7020. ( 6)   4310. ( 6)   4064. ( 6)   1816. ( 6)
12/15/73   0600-0800        7140. ( 5)   4493. ( 5)   4717. ( 5)   1846. ( 6)
12/15/73   0800-1000        8166. ( 5)   7215. ( 5)   7256. ( 6)   1756. ( 6)
12/15/73   1000-1200        6541. ( 6)   4987. ( 6)   5205. ( 6)   1569. ( 6)
12/15/73   1200-1400        5173. ( 6)   3931. ( 6)   3775. ( 6)   1663. ( 6)
12/15/73   1400-1600        4778. ( 5)   4118. ( 5)   3276. ( 5)   1790. ( 6)
12/15/73   1600-1800        4866. ( 6)   4195. ( 6)   3463. ( 6)   1968. ( 6)
12/15/73   1800-2000        5354. ( 6)   4530. ( 6)   3829. ( 6)   1998. ( 6)
12/15/73   2000-2200        5446. ( 6)   4470. ( 6)   3432. ( 6)   1937. ( 6)
12/15/73   2200-2400        5663. ( 5)   4880. ( 5)   3762. ( 5)   1979. ( 6)

DAILY AVERAGE =             6149.        4589.        4232.        1806.
 (AVG OF 2HR VALUES)


12/16/73   0000-0200        5762. ( 6)   4674. ( 6)   3898. ( 6)   1940. ( 6)
12/16/73   0200-0400        5935. ( 6)   4816. ( 6)   4070. ( 6)   2050. ( 6)
12/16/73   0400-0600        6076. ( 6)   4926. ( 6)   4211. ( 6)   2285. ( 6)
12/16/73   0600-0800        5537. ( 5)   4521. ( 5)   3760. ( 5)   1925. ( 6)
12/16/73   0800-1000        5929. ( 6)   4932. ( 6)   4176. ( 6)   2241. ( 6)
12/16/73   1000-1200        6549. ( 6)   5340. ( 6)   4886. ( 6)   2740. ( 6)
12/16/73   1200-1400        6867. ( 6)   5748. ( 6)   5234. ( 6)   3178. ( 6)
12/16/73   1400-1600        5890. ( 4)   4756. ( 4)   4056. ( 5)   2262. ( 6)
12/16/73   1600-1800        5897. ( 6)   5051. ( 6)   4174. ( 6)   2118. ( 6)
12/16/73   1800-2000        9926. ( 6)   9200. ( 6)   7749. ( 6)   2398. ( 6)
12/16/73   2000-2200        7152. ( 6)   5839. ( 5)   6305. ( 6)   2829. ( 6)
12/16/73   2200-2400        5835. ( 5)   4615. ( 5)   4763. ( 5)   2006. ( 6)

DAILY AVERAGE =             6446.        5368.        4773.        2331.
 (AVG OF 2HR VALUES)


12/17/73   0000-0200        5715. ( 6)   4330. ( 6)   4452. ( 6)   2113. ( 6)
12/17/73   0200-0400        5706. ( 6)   4413. ( 6)   4443. ( 6)   2042. ( 6)
12/17/73   0400-0600        5881. ( 6)   4650. ( 6)   4527. ( 6)   2217. ( 6)
12/17/73   0600-0800        5668. ( 5)   4586. ( 5)   4474. ( 5)   2197. ( 6)
12/17/73   0800-1000        6227. ( 5)   4568. ( 4)   4894. ( 4)   2535. ( 5)
12/17/73   1000-1200          ******       ******       ******       ******
12/17/73   1200-1400          ******       ******       ******       ******
12/17/73   1400-1600          ******       ******       ******       ******
12/17/73   1600-1800          ******       ******       ******       ******
12/17/73   1800-2000          ******       ******       ******       ******
12/17/73   2000-2200          ******       ******       ******       ******
12/17/73   2200-2400          ******       ******       ******       ******
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HOUSE  3   FALL-WINTER    CO AVERAGE CONCENTRATIONS ,UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                  STATION
  DATE          TIME              1               1A
                                                                3            4
                             OVER STOVE  1M FROM STOVE        BD RM      OUTSIDE

12/20/73   0000-0200           ******         ******          ******       ******
12/20/73   0200-0400           ******         ******          ******       ******
12/20/73   0400-0600           ******         ******          ******       ******
12/20/73   0600-0800           ******         ******          ******       ******
12/20/73   0800-1000           ******         ******          ******       ******
12/20/73   1000-1200           ******         ******          ******       ******
12/20/73   1200-1400           ******         ******          ******       ******
12/20/73   1400-1600           ******         ******          ******       ******
12/20/73   1600-1800        6333. ( 5)    5491. ( 5)    5674. ( 5)    5088. ( 5)
12/20/73   1800-2000        6681. ( 6)    6010. ( 6)    6071. ( 6)    5369. ( 6)
12/20/73   2000-2200        7780. ( 6)    7841. ( 6)    7383. ( 6)    6468. ( 6)
12/20/73   2200-2400        9579. ( 6)    8695. ( 6)    9061. ( 6)    7810. ( 6)



12/21/73   0000-0200        9481. ( 5)    8530. ( 5)    8603. ( 5)    7175. ( 5)
12/21/73   0200-0400        7223. ( 6)    6095. ( 6)    6461. ( 6)    3715. ( 6)
12/21/73   0400-0600        6596. ( 6)    5436. ( 6)    5955. ( 6)    3362. ( 6)
12/21/73   0600-0800        6304. ( 6)    5206. ( 6)    5602. ( 6)    3223. ( 6)
12/21/73   0800-1000        6538. ( 2)    5348. ( 2)    5806. ( 2)    3609. ( 2)
12/21/73   1000-1200       10922. ( 2)   11014. ( 2)    9275. ( 2)    3417. ( 2)
12/21/73   1200-1400        8105. ( 6)    7739. ( 6)    7129. ( 6)    3163. ( 6)
12/21/73   1400-1600        5556. ( 5)    6749. ( 5)    4922. ( 5)    2711. ( 6)
12/21/73   1600-1800        6230. ( 6)    6323. ( 6)    5112. ( 6)    2532. ( 6)
12/21/73   1800-2000       11000. ( 5)   11979. ( 4)    9471. ( 5)    1789. ( 5)
12/21/73   2000-2200        8219. ( 6)    8188. ( 6)    6059. ( 5)    1694. ( 6)
12/21/73   2200-2400        5956. ( 4)    6101. ( 5)    4274. ( 5)    1495. ( 6)

DAILY AVERAGE =             7677.         7392.         6556.         3157.
 (AVG OF 2HR VALUES)


12/22/73   0000-0200        6859. ( 6)    7045. ( 6)    5212. ( 6)    1700. ( 6)
12/22/73   0200-0400        7390. ( 6)    7483. ( 6)    5463. ( 6)    2045. ( 6)
12/22/73   0400-0600        7517. ( 6)    7486. ( 6)    5746. ( 6)    2390. ( 6)
12/22/73   0600-0800        6480. ( 5)    6480. ( 5)    4686. ( 5)    1598. ( 5)
12/22/73   0800-1000        7185. ( 4)    7002. ( 4)    6590. ( 6)    1617. ( 6)
12/22/73   1000-1200        7261. ( 6)    6468. ( 6)    4881. ( 6)    1739. ( 6)
12/22/73   1200-1400        5003. ( 6)    5003. ( 6)    3265. ( 6)    1556. ( 6)
12/22/73   1400-1600        5623. ( 6)    6429. ( 5)    3992. ( 5)    1777. ( 6)
12/22/73   1600-1800        5240. ( 6)    5122. ( 6)    3032. ( 6)    2090. ( 6)
12/22/73   1800-2000        6535. ( 6)    6217. ( 5)    4887. ( 6)    2708. ( 6)
12/22/73   2000-2200        7595. ( 6)    7665. ( 5)    6005. ( 6)    3827. ( 6)
12/22/73   2200-2400        5554. ( 6)    5605. ( 5)    4418. ( 5)    2325. ( 5)

DAILY AVERAGE =             6520.         6500.         4848.         2114.
 (AVG OF 2HR VALUES)
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HOUSE 3 FALL-WINTER CO AVERAGE CONCENTRATIONS ,UG/M3
VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
MAX.: 6 PER 2HR,72 PER DAY

DATE	TIME	STATION			
		1 OVER STOVE	1A 1M FROM STOVE	3 BD RM	4 OUTSIDE
12/23/73	0000-0200	5920. (6)	6190. (6)	4751. (6)	2414. (6)
12/23/73	0200-0400	6900. (6)	6960. (6)	5731. (6)	3454. (6)
12/23/73	0400-0600	8598. (6)	8778. (6)	7909. (6)	5602. (6)
12/23/73	0600-0800	6282. (6)	5676. (5)	4274. (5)	3044. (5)
12/23/73	0800-1000	5560. (6)	5710. (6)	4332. (6)	2534. (6)
12/23/73	1000-1200	7421. (5)	7601. (5)	7229. (6)	2256. (6)
12/23/73	1200-1400	6201. (6)	6291. (6)	4793. (6)	2306. (6)
12/23/73	1400-1600	5915. (5)	6055. (4)	4379. (5)	2274. (5)
12/23/73	1600-1800	9146. (5)	9217. (5)	8481. (6)	3106. (6)
12/23/73	1800-2000	6690. (6)	6750. (6)	5740. (6)	3156. (6)
12/23/73	2000-2200	6325. (6)	7156. (6)	4870. (6)	2345. (6)
12/23/73	2200-2400	5893. (3)	5828. (2)	3885. (2)	2110. (2)
DAILY AVERAGE = (AVG OF 2HR VALUES)		6738.	6851.	5531.	2883.
12/24/73	0000-0200	5296. (1)	5650. (1)	3883. (1)	1764. (1)
12/24/73	0200-0400	5676. (6)	5706. (6)	3881. (6)	1821. (6)
12/24/73	0400-0600	5702. (6)	5643. (6)	3847. (6)	1845. (6)
12/24/73	0600-0800	5663. (6)	5771. (5)	3758. (5)	2165. (5)
12/24/73	0800-1000	5947. (6)	6005. (6)	4182. (6)	2504. (6)
12/24/73	1000-1200	6307. (6)	6191. (6)	4600. (6)	2343. (6)
12/24/73	1200-1400	5394. (6)	5046. (6)	3744. (6)	2414. (6)
12/24/73	1400-1600	5694. (6)	5659. (5)	3992. (5)	2147. (5)
12/24/73	1600-1800	6972. (6)	7420. (4)	6307. (6)	2459. (6)
12/24/73	1800-2000	9923. (6)	9836. (6)	7551. (6)	3298. (6)
12/24/73	2000-2200	9547. (6)	9749. (6)	8187. (6)	2980. (6)
12/24/73	2200-2400	11680. (6)	14124. (5)	10804. (5)	2916. (5)
DAILY AVERAGE = (AVG OF 2HR VALUES)		6983.	7233.	5395.	2388.
12/25/73	0000-0200	9745. (6)	9568. (6)	7772. (6)	2621. (6)
12/25/73	0200-0400	7716. (6)	7716. (6)	5450. (6)	2624. (6)
12/25/73	0400-0600	7130. (6)	7219. (6)	4923. (6)	2774. (6)
12/25/73	0600-0800	6341. (6)	6250. (5)	3989. (5)	2169. (5)
12/25/73	0800-1000	6815. (6)	7639. (6)	5520. (6)	2193. (6)
12/25/73	1000-1200	6714. (6)	6831. (6)	5094. (6)	2681. (6)
12/25/73	1200-1400	7671. (6)	7554. (6)	5905. (6)	2667. (6)
12/25/73	1400-1600	7292. (6)	7346. (5)	5580. (5)	2321. (5)
12/25/73	1600-1800	7649. (6)	7766. (6)	5971. (6)	2998. (6)
12/25/73	1800-2000	8263. (6)	8292. (6)	6585. (6)	3435. (6)
12/25/73	2000-2200	8435. (6)	8464. (6)	6698. (6)	3224. (6)
12/25/73	2200-2400	8064. (6)	8054. (5)	6284. (5)	3168. (5)
DAILY AVERAGE = (AVG OF 2HR VALUES)		7653.	7725.	5814.	2739.

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HOUSE  3   FALL-WINTER    CO AVERAGE CONCENTRATIONS ,UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                  STATION
  DATE         TIME             1            1A              3              4
                            OVER STOVE 1M FROM STOVE       BD RM        OUTSIDE

12/26/73   0000-0200       7912. ( 6)  7912. ( 6)   6119. ( 6)   3081. ( 6)
12/26/73   0200-0400       7623. ( 6)  7739. ( 6)   6061. ( 6)   3284. ( 6)
12/26/73   0400-0600       7912. ( 6)  8028. ( 6)   6235. ( 6)   3804. ( 6)
12/26/73   0600-0800       8582. ( 6)  8720. ( 5)   7095. ( 5)   5826. ( 5)
12/26/73   0800-1000       9686. ( 6)  9803. ( 6)   7978. ( 6)   3769. ( 6)
12/26/73   1000-1200      10189. ( 6) 10248. ( 6)   8540. ( 6)   5332. ( 6)
12/26/73   1200-1400      11075. ( 6) 11163. ( 6)   9485. ( 6)   5511. ( 6)
12/26/73   1400-1600      10906. ( 6) 10844. ( 5)   9184. ( 5)   5527. ( 5)
12/26/73   1600-1800      11466. ( 6) 11319. ( 6)   9552. ( 6)   7374. ( 6)
12/26/73   1800-2000      12474. ( 4) 12562. ( 4)  10399. ( 4)  10752. ( 4)
12/26/73   2000-2200         ******      ******       ******       ******
12/26/73   2200-2400         ******      ******       ******       ******



12/27/73   0000-0200      11834. ( 3) 11598. ( 3)   9479. ( 3)   1943. ( 3)
12/27/73   0200-0400       8684. ( 6)  8566. ( 6)   6623. ( 6)   2473. ( 6)
12/27/73   0400-0600       7830. ( 6)  7860. ( 6)   6005. ( 6)   3945. ( 6)
12/27/73   0600-0800       8287. ( 6)  8389. ( 5)   6588. ( 5)   4681. ( 5)
12/27/73   0800-1000       9317. ( 6)  9376. ( 6)   7639. ( 6)   5137. ( 6)
12/27/73   1000-1200       6962. ( 6)  6835. ( 5)   5254. ( 6)   3253. ( 6)
12/27/73   1200-1400       5431. ( 6)  5549. ( 6)   4018. ( 6)   3164. ( 6)
12/27/73   1400-1600       5179. ( 6)  4978. ( 5)   3212. ( 5)   2682. ( 5)
12/27/73   1600-1800       4934. ( 6)  4846. ( 6)   3492. ( 6)   2226. ( 6)
12/27/73   1800-2000       7074. ( 6)  7339. ( 6)   6044. ( 6)   3012. ( 6)
12/27/73   2000-2200       8892. ( 4)  8980. ( 4)   7037. ( 4)   3726. ( 4)
12/27/73   2200-2400         ******      ******       ******       ******
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Appendix B-6

NO_2, NO, and CO data for House No. 4 - Fall/Winter

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HØUSE  -4   FALL-WINTER      NØ2 AVERAGE CØNCENTRATIØNS , UG/M3
  VALUES IN ( ) ARE NØ. ØF ØBSERVATIØNS IN PERIØD
     MAX.: 6 PER 2HR,72 PER DAY

                                                  STATIØN
 DATE          TIME             1              1A              2               4
                             ØVER STØVE 1M FRØM STØVE LIV/    RM       ØUTSIDE

1/29/74   0000-0200          ******         ******         ******         ******
1/29/74   0200-0400          ******         ******         ******         ******
1/29/74   0400-0600          ******         ******         ******         ******
1/29/74   0600-0800          ******         ******         ******         ******
1/29/74   0800-1000          ******         ******         ******         ******
1/29/74   1000-1200          ******         ******         ******         ******
1/29/74   1200-1400         86.4 ( 5)      74.4 ( 5)      72.4 ( 5)     120.6 ( 5)
1/29/74   1400-1600         75.4 ( 6)      40.2 ( 6)      30.1 ( 6)     120.6 ( 6)
1/29/74   1600-1800         63.6 ( 6)      40.2 ( 6)      33.5 ( 6)     219.4 ( 6)
1/29/74   1800-2000        110.5 ( 6)      38.5 ( 6)      56.9 ( 6)     232.7 ( 6)
1/29/74   2000-2200         67.0 ( 6)     139.0 ( 6)      78.7 ( 6)     162.4 ( 6)
1/29/74   2200-2400         40.2 ( 6)     142.3 ( 6)     100.5 ( 6)      55.2 ( 6)



1/30/74   0000-0200         40.2 ( 6)      70.3 ( 6)      70.3 ( 6)      51.9 ( 6)
1/30/74   0200-0400         33.5 ( 6)      73.7 ( 6)     100.5 ( 6)      56.9 ( 6)
1/30/74   0400-0600         35.1 ( 6)      68.7 ( 6)      67.0 ( 6)      48.5 ( 6)
1/30/74   0600-0800         46.9 ( 6)     118.9 ( 6)      65.3 ( 6)      70.3 ( 6)
1/30/74   0800-1000         40.2 ( 6)     113.9 ( 6)      83.7 ( 6)      67.0 ( 6)
1/30/74   1000-1200        190.9 ( 4)     277.3 ( 5)      77.8 ( 4)     145.7 ( 4)
1/30/74   1200-1400          ******         ******         ******         ******
1/30/74   1400-1600        235.1 ( 5)     120.6 ( 5)     166.8 ( 5)      56.3 ( 5)
1/30/74   1600-1800        649.7 ( 6)     453.8 ( 6)     206.0 ( 6)     159.1 ( 6)
1/30/74   1800-2000        180.9 ( 6)     154.0 ( 6)     130.6 ( 6)     130.6 ( 6)
1/30/74   2000-2200        199.3 ( 6)     129.0 ( 6)     125.6 ( 6)     144.0 ( 6)
1/30/74   2200-2400        254.5 ( 6)     103.8 ( 6)     123.9 ( 6)     110.5 ( 6)



1/31/74   0000-0200        234.4 ( 6)     103.8 ( 6)     102.2 ( 6)      87.1 ( 6)
1/31/74   0200-0400        115.6 ( 6)      95.5 ( 6)      70.3 ( 6)      80.4 ( 6)
1/31/74   0400-0600        108.8 ( 6)      80.4 ( 6)      70.3 ( 6)      82.1 ( 6)
1/31/74   0600-0800        147.4 ( 6)      97.1 ( 6)     107.2 ( 6)      93.8 ( 6)
1/31/74   0800-1000        117.2 ( 6)      85.4 ( 6)      92.1 ( 6)      83.7 ( 6)
1/31/74   1000-1200         83.7 ( 6)      70.3 ( 6)      60.3 ( 6)      80.4 ( 6)
1/31/74   1200-1400        174.1 ( 6)      97.1 ( 6)      82.1 ( 6)      92.1 ( 6)
1/31/74   1400-1600        113.9 ( 6)      75.3 ( 6)      82.0 ( 6)      56.9 ( 6)
1/31/74   1600-1800        587.7 ( 6)     301.4 ( 6)      82.1 ( 6)      67.0 ( 6)
1/31/74   1800-2000        207.6 ( 6)      98.8 ( 6)     128.9 ( 6)      80.4 ( 6)
1/31/74   2000-2200        147.4 ( 6)      75.3 ( 6)      78.7 ( 6)      26.8 ( 6)
1/31/74   2200-2400         87.1 ( 6)      60.3 ( 6)      40.2 ( 6)      10.0 ( 3)

DAILY AVERAGE =            177.1          103.4           83.0           70.1
 (AVG ØF 2HR VALUES)
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HØUSE  -4   FALL-WINTER     NØ2 AVERAGE CØNCENTRATIØNS , UG/M3
  VALUES IN ( ) ARE NØ. ØF ØBSERVATIØNS IN PERIØD
     MAX.: 6 PER 2HR,72 PER DAY

                                                  STATIØN
   DATE       TIME             1            1A             2              4
                          ØVER STØVE 1M FRØM STØVE LIV/   RM       ØUTSIDE

  2/ 1/74   0000-0200      72.0 ( 6)    48.5 ( 6)    31.8 ( 6)     12.5 ( 4)
  2/ 1/74   0200-0400      63.6 ( 6)    43.5 ( 6)    31.8 ( 6)     12.0 ( 5)
  2/ 1/74   0400-0600      58.6 ( 6)    43.5 ( 6)    28.4 ( 6)     12.0 ( 5)
  2/ 1/74   0600-0800      97.1 ( 6)    60.3 ( 6)    36.8 ( 6)     25.1 ( 6)
  2/ 1/74   0800-1000     125.6 ( 6)    73.7 ( 6)    50.2 ( 6)     20.1 ( 6)
  2/ 1/74   1000-1200     204.3 ( 3)   180.8 ( 2)    63.6 ( 3)     35.1 ( 2)
  2/ 1/74   1200-1400     155.7 ( 6)    82.1 ( 6)    46.9 ( 6)     15.0 ( 6)
  2/ 1/74   1400-1600     207.7 ( 6)    93.8 ( 6)    40.2 ( 6)     14.0 ( 5)
  2/ 1/74   1600-1800     614.6 ( 6)   346.6 ( 6)    90.4 ( 6)     26.8 ( 6)
  2/ 1/74   1800-2000     249.5 ( 6)   107.2 ( 6)    73.7 ( 6)     26.8 ( 6)
  2/ 1/74   2000-2200     231.1 ( 6)   117.2 ( 6)    88.8 ( 6)     43.5 ( 6)
  2/ 1/74   2200-2400     165.8 ( 6)    75.4 ( 6)    56.9 ( 6)     33.5 ( 6)

DAILY AVERAGE =           187.1        106.1         53.3          23.0
 (AVG ØF 2HR VALUES)


  2/ 2/74   0000-0200     142.4 ( 6)    60.3 ( 6)    41.9 ( 6)     20.1 ( 6)
  2/ 2/74   0200-0400     125.6 ( 6)    55.2 ( 6)    48.5 ( 6)     15.0 ( 6)
  2/ 2/74   0400-0600     117.2 ( 6)    55.2 ( 6)    36.8 ( 6)     21.8 ( 6)
  2/ 2/74   0600-0800     122.3 ( 6)    56.9 ( 6)    35.1 ( 6)     20.1 ( 6)
  2/ 2/74   0800-1000     239.5 ( 6)    97.1 ( 6)    45.2 ( 6)     21.8 ( 6)
  2/ 2/74   1000-1200     150.7 ( 6)    60.3 ( 6)    53.6 ( 6)     18.4 ( 6)
  2/ 2/74   1200-1400     582.7 ( 6)   125.6 ( 6)    50.2 ( 6)     26.8 ( 6)
  2/ 2/74   1400-1600     185.9 ( 6)   123.9 ( 6)    63.6 ( 6)     33.5 ( 6)
  2/ 2/74   1600-1800     169.1 ( 6)    95.5 ( 6)    67.0 ( 6)     38.5 ( 6)
  2/ 2/74   1800-2000     177.5 ( 6)    60.3 ( 6)    88.8 ( 6)     36.8 ( 6)
  2/ 2/74   2000-2200     160.8 ( 6)    63.6 ( 6)    65.3 ( 6)     25.1 ( 6)
  2/ 2/74   2200-2400     184.2 ( 6)    87.1 ( 6)    46.9 ( 6)     23.4 ( 6)

DAILY AVERAGE =           196.5         78.4         53.6          25.1
 (AVG ØF 2HR VALUES)


  2/ 3/74   0000-0200     127.3 ( 6)    58.6 ( 6)    41.8 ( 6)     20.1 ( 6)
  2/ 3/74   0200-0400     130.6 ( 6)    55.2 ( 6)    41.8 ( 6)     20.1 ( 6)
  2/ 3/74   0400-0600     144.0 ( 6)    51.9 ( 6)    43.5 ( 6)     18.4 ( 6)
  2/ 3/74   0600-0800     118.9 ( 6)    50.2 ( 6)    30.1 ( 6)     20.1 ( 6)
  2/ 3/74   0800-1000     127.3 ( 6)    51.9 ( 6)    28.4 ( 6)     21.8 ( 6)
  2/ 3/74   1000-1200     204.3 ( 6)   100.5 ( 6)    58.6 ( 6)     21.8 ( 6)
  2/ 3/74   1200-1400     164.1 ( 6)    67.0 ( 6)    75.4 ( 6)     20.1 ( 6)
  2/ 3/74   1400-1600     236.1 ( 6)    73.7 ( 6)    67.0 ( 6)     30.1 ( 6)
  2/ 3/74   1600-1800       ******        ******       ******        ******
  2/ 3/74   1800-2000       ******        ******       ******        ******
  2/ 3/74   2000-2200       ******        ******       ******        ******
  2/ 3/74   2200-2400       ******        ******       ******        ******
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HØUSE  -4   FALL-WINTER      NØ2 AVERAGE CØNCENTRATIØNS , UG/M3
  VALUES IN ( ) ARE NØ. ØF ØBSERVATIØNS IN PERIØD
     MAX.: 6 PER 2HR,72 PER DAY

                                                    STATIØN
 DATE          TIME            1              1A              2               4
                           ØVER STØVE 1M FRØM STØVE LIV      RM       ØUTSIDE

2/ 4/74   0000-0200        ******          ******          ******          ******
2/ 4/74   0200-0400        ******          ******          ******          ******
2/ 4/74   0400-0600        ******          ******          ******          ******
2/ 4/74   0600-0800        ******          ******          ******          ******
2/ 4/74   0800-1000        ******          ******          ******          ******
2/ 4/74   1000-1200        ******          ******          ******          ******
2/ 4/74   1200-1400        ******          ******          ******          ******
2/ 4/74   1400-1600        ******          ******          ******          ******
2/ 4/74   1600-1800      562.6 ( 3)      264.6 ( 3)      144.0 ( 3)      53.6 ( 3)
2/ 4/74   1800-2000      197.6 ( 6)       93.8 ( 6)       77.0 ( 6)      48.6 ( 6)
2/ 4/74   2000-2200      200.9 ( 6)       85.4 ( 6)       67.0 ( 6)      31.8 ( 6)
2/ 4/74   2200-2400      182.5 ( 6)       77.0 ( 6)       58.6 ( 6)      23.4 ( 6)



2/ 5/74   0000-0200      127.3 ( 6)       56.9 ( 6)       48.6 ( 6)      20.1 ( 5)
2/ 5/74   0200-0400      115.6 ( 6)       46.9 ( 6)       40.2 ( 6)      18.4 ( 6)
2/ 5/74   0400-0600      105.5 ( 6)       45.2 ( 6)       25.1 ( 6)      21.8 ( 6)
2/ 5/74   0600-0800      251.2 ( 6)       87.1 ( 6)       48.6 ( 6)      28.4 ( 6)
2/ 5/74   0800-1000      187.6 ( 6)       83.7 ( 6)       50.2 ( 6)      20.1 ( 6)
2/ 5/74   1000-1200      164.1 ( 3)       80.4 ( 3)       67.0 ( 3)      13.4 ( 3)
2/ 5/74   1200-1400        ******          ******          ******          ******
2/ 5/74   1400-1600        ******          ******          ******          ******
2/ 5/74   1600-1800      281.3 ( 3)      224.4 ( 3)       83.7 ( 3)      20.1 ( 3)
2/ 5/74   1800-2000      185.9 ( 6)      100.5 ( 6)       88.7 ( 6)      25.1 ( 6)
2/ 5/74   2000-2200      169.2 ( 6)       82.0 ( 6)       51.9 ( 6)      20.1 ( 6)
2/ 5/74   2200-2400      159.1 ( 6)       97.1 ( 6)       46.9 ( 6)      26.8 ( 6)



2/ 6/74   0000-0200      117.2 ( 6)       56.9 ( 6)       36.8 ( 6)      26.8 ( 6)
2/ 6/74   0200-0400       38.7 ( 6)       55.2 ( 6)       30.1 ( 6)      23.4 ( 6)
2/ 6/74   0400-0600       83.7 ( 6)       48.5 ( 6)       36.8 ( 6)      36.8 ( 6)
2/ 6/74   0600-0800      144.0 ( 6)       97.1 ( 6)       50.2 ( 6)      61.9 ( 6)
2/ 6/74   0800-1000      144.0 ( 6)       87.1 ( 6)       75.4 ( 6)      62.0 ( 6)
2/ 6/74   1000-1200      120.6 ( 1)       60.3 ( 1)       80.4 ( 1)      40.2 ( 1)
2/ 6/74   1200-1400        ******          ******          ******          ******
2/ 6/74   1400-1600      296.4 ( 6)      236.1 ( 6)      160.7 ( 6)      48.5 ( 6)
2/ 6/74   1600-1800     1239.2 ( 6)      765.3 ( 6)      549.7 ( 6)      72.0 ( 6)
2/ 6/74   1800-2000      301.4 ( 6)      251.2 ( 6)      195.9 ( 6)      85.4 ( 6)
2/ 6/74   2000-2200      274.5 ( 6)      182.5 ( 6)      140.7 ( 6)      63.6 ( 6)
2/ 6/74   2200-2400      254.5 ( 6)      170.8 ( 6)      127.3 ( 6)      46.9 ( 6)
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HOUSE  -4   FALL-WINTER     NO2 AVERAGE CONCENTRATIONS , UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                   STATION
   DATE        TIME             1             1A              2               4
                          OVER STOVE 1M FROM STOVE LIV/    RM          OUTSIDE

  2/ 7/74   0000-0200     192.5 ( 6)   115.5 ( 6)    80.4 ( 6)      30.1 ( 6)
  2/ 7/74   0200-0400     157.4 ( 6)   122.2 ( 6)    70.3 ( 6)      41.9 ( 6)
  2/ 7/74   0400-0600     144.0 ( 6)    92.1 ( 6)    70.3 ( 6)      40.2 ( 6)
  2/ 7/74   0600-0800     130.7 ( 6)   127.3 ( 6)    88.8 ( 6)      50.2 ( 6)
  2/ 7/74   0800-1000     176.8 ( 5)   133.7 ( 5)   103.8 ( 6)      53.6 ( 6)
  2/ 7/74   1000-1200     334.9 ( 6)   288.0 ( 6)   234.4 ( 6)      36.8 ( 6)
  2/ 7/74   1200-1400     353.3 ( 6)   214.3 ( 6)   165.8 ( 6)      35.2 ( 6)
  2/ 7/74   1400-1600     214.3 ( 6)   170.8 ( 6)   128.9 ( 6)      46.9 ( 6)
  2/ 7/74   1600-1800     555.9 ( 6)   348.3 ( 6)   272.9 ( 6)      46.2 ( 5)
  2/ 7/74   1800-2000     247.8 ( 6)   164.1 ( 6)   115.6 ( 6)      67.0 ( 6)
  2/ 7/74   2000-2200     216.0 ( 6)   149.0 ( 6)   190.9 ( 6)      25.1 ( 6)
  2/ 7/74   2200-2400     212.7 ( 6)   147.3 ( 6)   100.5 ( 6)      33.5 ( 6)

DAILY AVERAGE =           246.4        173.2        135.2           42.2
 (AVG OF 2HR VALUES)


  2/ 8/74   0000-0200     172.5 ( 6)   105.5 ( 6)    75.3 ( 6)      55.3 ( 6)
  2/ 8/74   0200-0400     132.3 ( 6)    90.4 ( 6)    68.6 ( 6)      58.6 ( 6)
  2/ 8/74   0400-0600     134.0 ( 3)    90.4 ( 3)    67.0 ( 3)      56.9 ( 3)
  2/ 8/74   0600-0800       ******       ******       ******         ******
  2/ 8/74   0800-1000       ******       ******       ******         ******
  2/ 8/74   1000-1200       ******       ******       ******         ******
  2/ 8/74   1200-1400     196.9 ( 5)   116.6 ( 5)    90.4 ( 5)      40.2 ( 5)
  2/ 8/74   1400-1600     236.1 ( 6)   182.5 ( 6)   105.5 ( 6)      58.6 ( 6)
  2/ 8/74   1600-1800     750.2 ( 6)   465.5 ( 6)   304.8 ( 6)      70.3 ( 6)
  2/ 8/74   1800-2000     234.4 ( 6)   182.5 ( 6)   130.6 ( 6)      70.3 ( 6)
  2/ 8/74   2000-2200     244.5 ( 6)   175.8 ( 6)   113.9 ( 6)      62.0 ( 6)
  2/ 8/74   2200-2400     214.3 ( 6)   142.3 ( 6)    93.8 ( 6)      60.3 ( 6)



  2/ 9/74   0000-0200     170.8 ( 6)   108.8 ( 6)    72.0 ( 6)      60.3 ( 6)
  2/ 9/74   0200-0400     139.0 ( 6)    93.8 ( 6)    70.3 ( 6)      60.3 ( 6)
  2/ 9/74   0400-0600     117.2 ( 6)    88.7 ( 6)    62.0 ( 6)      53.6 ( 6)
  2/ 9/74   0600-0800     107.2 ( 6)    75.3 ( 6)    63.6 ( 6)      58.6 ( 6)
  2/ 9/74   0800-1000     263.3 ( 5)   172.8 ( 5)    96.5 ( 5)      36.2 ( 5)
  2/ 9/74   1000-1200     222.7 ( 6)   150.7 ( 6)    85.4 ( 6)      17.6 ( 4)
  2/ 9/74   1200-1400     164.1 ( 6)   152.4 ( 6)    72.0 ( 6)     **********
  2/ 9/74   1400-1600     201.0 ( 6)   142.3 ( 6)    93.8 ( 6)      10.0 ( 3)
  2/ 9/74   1600-1800     209.3 ( 6)   184.2 ( 6)   145.7 ( 6)      22.6 ( 4)
  2/ 9/74   1800-2000     239.4 ( 6)   167.4 ( 6)   120.6 ( 6)      48.5 ( 6)
  2/ 9/74   2000-2200     159.1 ( 6)   103.8 ( 6)    77.0 ( 6)      33.5 ( 6)
  2/ 9/74   2200-2400     338.2 ( 6)   192.6 ( 6)   118.9 ( 6)      18.4 ( 6)

DAILY AVERAGE =           194.3        136.1         89.8           38.3
 (AVG OF 2HR VALUES)
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HOUSE  -4   FALL-WINTER      NO2 AVERAGE CONCENTRATIONS , UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                     STATION
  DATE          TIME              1              1A             2                 4
                               OVER STOVE 1M FROM STOVE LIV/   RM          OUTSIDE

  2/10/74    0000-0200        207.6 ( 6)    150.7 ( 6)     88.8 ( 6)     20.1 ( 6)
  2/10/74    0200-0400        169.1 ( 6)     88.8 ( 6)     68.6 ( 6)     51.9 ( 6)
  2/10/74    0400-0600        122.2 ( 6)     73.7 ( 6)     56.9 ( 6)     46.9 ( 6)
  2/10/74    0600-0800         88.7 ( 6)     63.6 ( 6)     48.5 ( 6)     46.9 ( 6)
  2/10/74    0800-1000        177.5 ( 6)    107.2 ( 6)     73.6 ( 6)     40.2 ( 6)
  2/10/74    1000-1200        192.6 ( 6)    130.6 ( 6)     85.4 ( 6)     36.8 ( 6)
  2/10/74    1200-1400        227.7 ( 6)    142.3 ( 6)     88.7 ( 6)     30.1 ( 6)
  2/10/74    1400-1600        216.0 ( 6)    155.7 ( 6)    107.2 ( 6)     16.7 ( 6)
  2/10/74    1600-1800        286.3 ( 6)    219.3 ( 6)    142.4 ( 6)     28.4 ( 6)
  2/10/74    1800-2000        207.6 ( 6)    132.3 ( 6)     92.1 ( 6)     51.9 ( 6)
  2/10/74    2000-2200        214.3 ( 6)    117.2 ( 6)     87.1 ( 6)     92.1 ( 6)
  2/10/74    2200-2400        155.8 ( 6)     90.4 ( 6)     63.6 ( 6)     67.0 ( 6)

DAILY AVERAGE =               188.8         122.7          83.5          44.1
 (AVG OF 2HR VALUES)


  2/11/74    0000-0200        132.3 ( 6)     80.4 ( 6)     60.3 ( 6)     48.5 ( 6)
  2/11/74    0200-0400        137.3 ( 6)     73.7 ( 6)     77.0 ( 6)     75.3 ( 6)
  2/11/74    0400-0600        125.6 ( 6)     85.4 ( 6)     62.0 ( 6)     67.0 ( 6)
  2/11/74    0600-0800        182.5 ( 6)    128.9 ( 6)     87.1 ( 6)     75.3 ( 6)
  2/11/74    0800-1000        325.5 ( 5)    226.0 ( 6)    160.8 ( 6)     97.1 ( 6)
  2/11/74    1000-1200        487.3 ( 6)    321.5 ( 6)    254.5 ( 6)     65.3 ( 6)
  2/11/74    1200-1400        323.9 ( 6)    566.0 ( 6)    370.1 ( 6)     30.1 ( 6)
  2/11/74    1400-1600        194.3 ( 3)    167.5 ( 3)    123.9 ( 3)     15.0 ( 2)
  2/11/74    1600-1800          ******        ******        ******        ******
  2/11/74    1800-2000          ******        ******        ******        ******
  2/11/74    2000-2200          ******        ******        ******        ******
  2/11/74    2200-2400          ******        ******        ******        ******



  2/13/74    0000-0200          ******        ******        ******        ******
  2/13/74    0200-0400          ******        ******        ******        ******
  2/13/74    0400-0600          ******        ******        ******        ******
  2/13/74    0600-0800          ******        ******        ******        ******
  2/13/74    0800-1000          ******        ******        ******        ******
  2/13/74    1000-1200          ******        ******        ******        ******
  2/13/74    1200-1400          ******        ******        ******        ******
  2/13/74    1400-1600        268.8 ( 4)    263.8 ( 4)    120.5 ( 4)    135.7 ( 4)
  2/13/74    1600-1800        346.6 ( 6)    288.0 ( 6)    189.2 ( 6)    154.1 ( 6)
  2/13/74    1800-2000        227.7 ( 6)    180.9 ( 6)    112.2 ( 6)    154.1 ( 6)
  2/13/74    2000-2200        236.1 ( 6)    202.6 ( 6)    134.0 ( 6)    117.2 ( 6)
  2/13/74    2200-2400        219.4 ( 6)    164.1 ( 6)    120.5 ( 6)    100.5 ( 6)
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HOUSE  -4   FALL-WINTER      NO2 AVERAGE CONCENTRATIONS , UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                       STATION
 DATE          TIME                1             1A              3              4
                            OVER STOVE 1M FROM STOVE LIV/    RM      OUTSIDE

 2/14/74   0000-0200        132.6 ( 6)  125.6 ( 6)    92.1 ( 6)    90.4 ( 6)
 2/14/74   0200-0400        184.2 ( 6)  113.9 ( 6)    87.1 ( 6)    82.0 ( 6)
 2/14/74   0400-0600        170.8 ( 6)   98.8 ( 6)    77.0 ( 6)    36.8 ( 6)
 2/14/74   0600-0800        329.9 ( 6)  179.2 ( 6)   108.9 ( 6)    36.8 ( 6)
 2/14/74   0800-1000        205.9 ( 6)  149.1 ( 6)    93.8 ( 6)    24.1 ( 5)
 2/14/74   1000-1200        296.4 ( 6)  182.5 ( 6)   103.8 ( 6)    12.0 ( 5)
 2/14/74   1200-1400        195.9 ( 6)  117.2 ( 6)    95.4 ( 6)    13.4 ( 3)
 2/14/74   1400-1600        838.9 ( 6)  619.6 ( 6)   333.2 ( 6)    12.0 ( 5)
 2/14/74   1600-1800        555.9 ( 6)  418.6 ( 6)   344.9 ( 6)    18.4 ( 6)
 2/14/74   1800-2000        289.7 ( 6)  180.9 ( 6)   120.6 ( 6)    20.1 ( 6)
 2/14/74   2000-2200        222.7 ( 6)  110.5 ( 6)    95.4 ( 6)    20.1 ( 6)
 2/14/74   2200-2400        169.1 ( 6)   98.8 ( 6)    73.7 ( 6)    20.1 ( 6)

DAILY AVERAGE =             304.3       199.6        135.5         32.2
 (AVG OF 2HR VALUES)
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HOUSE  -4   FALL-WINTER  NO      AVERAGE CONCENTRATIONS , UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                   STATION
 DATE        TIME            1              1A            2              4
                         OVER STOVE 1M FROM STOVE LIV/    RM      OUTSIDE

1/29/74   0000-0200        ******         ******         ******         ******
1/29/74   0200-0400        ******         ******         ******         ******
1/29/74   0400-0600        ******         ******         ******         ******
1/29/74   0600-0800        ******         ******         ******         ******
1/29/74   0800-1000        ******         ******         ******         ******
1/29/74   1000-1200        ******         ******         ******         ******
1/29/74   1200-1400     165.2 ( 5)     183.5 ( 5)     101.6 ( 4)     173.0 ( 5)
1/29/74   1400-1600     125.6 ( 6)     120.1 ( 6)      *******       243.5 ( 6)
1/29/74   1600-1800     130.0 ( 6)     105.9 ( 6)      *******       312.2 ( 6)
1/29/74   1800-2000     159.5 ( 6)     136.5 ( 6)      *******       560.2 ( 6)
1/29/74   2000-2200     180.2 ( 6)     340.8 ( 6)     144.1 ( 5)     366.9 ( 6)
1/29/74   2200-2400     282.8 ( 6)     478.3 ( 6)     291.6 ( 6)     116.3 ( 6)



1/30/74   0000-0200     263.2 ( 6)     340.7 ( 6)     264.3 ( 6)      53.5 ( 6)
1/30/74   0200-0400     219.5 ( 6)     265.4 ( 6)     221.7 ( 6)      65.5 ( 5)
1/30/74   0400-0600     186.8 ( 6)     227.2 ( 6)     187.9 ( 6)      65.5 ( 6)
1/30/74   0600-0800     225.0 ( 6)     340.7 ( 6)     232.6 ( 6)     136.5 ( 6)
1/30/74   0800-1000     293.8 ( 6)     389.9 ( 6)     297.0 ( 6)     146.3 ( 6)
1/30/74   1000-1200     609.4 ( 5)     633.0 ( 5)     370.9 ( 5)      96.6 ( 4)
1/30/74   1200-1400       ******         ******         ******         ******
1/30/74   1400-1600     491.4 ( 5)     454.7 ( 5)     302.7 ( 5)     110.1 ( 5)
1/30/74   1600-1800    1053.9 ( 6)     873.7 ( 6)     350.6 ( 6)      36.0 ( 6)
1/30/74   1800-2000     511.1 ( 6)     416.1 ( 6)     345.1 ( 6)      32.8 ( 6)
1/30/74   2000-2200     478.3 ( 6)     454.3 ( 6)     255.5 ( 6)      54.6 ( 6)
1/30/74   2200-2400     480.5 ( 6)     445.6 ( 6)     192.2 ( 6)      22.9 ( 6)



1/31/74   0000-0200     433.6 ( 6)     398.6 ( 6)     145.3 ( 6)      23.0  ( 6 )
1/31/74   0200-0400     291.6 ( 6)     283.9 ( 6)     156.2 ( 6)      16.0  (6  )
1/31/74   0400-0600     219.5 ( 6)     201.0 ( 6)     155.1 ( 6)      17.0  ( 6)
1/31/74   0600-0800     270.8 ( 6)     235.9 ( 6)     168.2 ( 6)      38.0  ( 6)
1/31/74   0800-1000     245.7 ( 6)     231.5 ( 6)     185.7 ( 6)      69.0  ( 6)
1/31/74   1000-1200     184.6 ( 6)     172.6 ( 6)     172.6 ( 6)     100.0  ( 6)
1/31/74   1200-1400     280.7 ( 6)     232.6 ( 6)     158.4 ( 6)      51.0  ( 6)
1/31/74   1400-1600     166.0 ( 6)     146.3 ( 6)     102.6 ( 6)      23.0  ( 6 )
1/31/74   1600-1800     917.4 ( 6)     655.3 ( 6)     167.1 ( 6)      21.0  ( 6 )
1/31/74   1800-2000     437.9 ( 6)     393.1 ( 6)     195.5 ( 6)      18.0  ( 6 )
1/31/74   2000-2200     288.3 ( 6)     218.4 ( 6)     123.4 ( 6)      10.0  ( 6 )
1/31/74   2200-2400     130.0 ( 6)      90.6 ( 6)      66.6 ( 6)      15.0  ( 6 )

DAILY AVERAGE =         322.2          271.7          149.7          33.0
 (AVG OF 2HR VALUES)
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HOUSE  -4   FALL-WINTER  NO     AVERAGE CONCENTRATIONS , UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                  STATION
  DATE        TIME            1             1A              2             4
                        OVER STOVE 1M FROM STOVE LIV      RM      OUTSIDE

 2/ 1/74   0000-0200      61.1 ( 6)    37.1 ( 6)     30.6 ( 6)     10.0 ( 6 )
 2/ 1/74   0200-0400      52.4 ( 6)    36.0 ( 6)     25.1 ( 6)     12.0 ( 6 )
 2/ 1/74   0400-0600      52.4 ( 6)    40.4 ( 6)     26.2 ( 6)      7.0 ( 6 )
 2/ 1/74   0600-0800     131.0 ( 6)    89.5 ( 6)     55.7 ( 6)     10.0 ( 6 )
 2/ 1/74   0800-1000     151.8 ( 6)   128.9 ( 6)     67.7 ( 6)     13.0 (6 )
 2/ 1/74   1000-1200     231.5 ( 3)   114.6 ( 2)     89.5 ( 3)      8.8 ( 3)
 2/ 1/74   1200-1400     170.4 ( 6)   115.7 ( 6)     73.1 ( 6)     12.0 ( 6)
 2/ 1/74   1400-1600     310.2 ( 6)   178.0 ( 6)     71.0 ( 6)     16.4 ( 6)
 2/ 1/74   1600-1800     779.8 ( 6)   723.0 ( 6)    140.9 ( 6)     19.7 ( 6)
 2/ 1/74   1800-2000     539.5 ( 6)   492.5 ( 6)    182.4 ( 6)     14.2 ( 6)
 2/ 1/74   2000-2200     391.0 ( 6)   344.0 ( 6)    205.3 ( 6)      9.8 ( 6)
 2/ 1/74   2200-2400     299.2 ( 6)   242.4 ( 6)    168.2 ( 6)      7.9 ( 6)

DAILY AVERAGE =          264.2         211.9          94.6         12. 0
 (AVG OF 2HR VALUES)


 2/ 2/74   0000-0200     229.3 ( 6)   168.2 ( 6)    122.3 ( 6)      7.7 ( 6)
 2/ 2/74   0200-0400     190.0 ( 6)   136.5 ( 6)     97.2 ( 6)      6.6 ( 4)
 2/ 2/74   0400-0600     174.7 ( 6)   123.4 ( 6)     85.2 ( 6)      6.6 ( 2)
 2/ 2/74   0600-0800     163.8 ( 6)   114.6 ( 6)     77.5 ( 6)      6.6 ( 2)
 2/ 2/74   0800-1000     288.3 ( 6)   222.8 ( 6)    105.9 ( 6)      6.6 ( 2)
 2/ 2/74   1000-1200     222.8 ( 6)   175.8 ( 6)    114.7 ( 6)      6.6 ( 3)
 2/ 2/74   1200-1400     491.4 ( 6)   290.5 ( 6)    115.7 ( 6)      9.8 ( 6)
 2/ 2/74   1400-1600     406.3 ( 6)   407.3 ( 6)    206.4 ( 6)     13.1 ( 6)
 2/ 2/74   1600-1800     370.2 ( 6)   326.5 ( 6)    193.3 ( 6)     10.9 ( 6)
 2/ 2/74   1800-2000     326.5 ( 6)   269.7 ( 6)    171.5 ( 6)      8.8 ( 6)
 2/ 2/74   2000-2200     250.1 ( 6)   202.0 ( 6)    123.4 ( 6)      6.6 ( 4)
 2/ 2/74   2200-2400     261.0 ( 6)   221.7 ( 6)    111.3 ( 6)      6.6 ( 2)

DAILY AVERAGE =          281.2         221.6         127.0          8.0
 (AVG OF 2HR VALUES)


 2/ 3/74   0000-0200     136.6 ( 6)   150.7 ( 6)     98.3 ( 6)      6.6 ( 1)
 2/ 3/74   0200-0400     166.0 ( 6)   110.3 ( 6)     72.0 ( 6)      6.6 ( 1)
 2/ 3/74   0400-0600     157.3 ( 6)    92.8 ( 6)     65.5 ( 6)      6.6 ( 5)
 2/ 3/74   0600-0800     145.3 ( 6)    90.6 ( 6)     60.1 ( 6)      6.6 ( 6)
 2/ 3/74   0800-1000     144.2 ( 6)    88.4 ( 6)     57.9 ( 6)     10.9 ( 6)
 2/ 3/74   1000-1200     221.7 ( 6)   166.0 ( 6)     92.8 ( 6)     13.1 ( 6)
 2/ 3/74   1200-1400     227.1 ( 6)   173.6 ( 6)    126.7 ( 6)     14.2 ( 6)
 2/ 3/74   1400-1600     328.7 ( 6)   230.4 ( 6)    125.6 ( 6)     17.5 ( 6)
 2/ 3/74   1600-1800       ******       ******        ******        ******
 2/ 3/74   1800-2000       ******       ******        ******        ******
 2/ 3/74   2000-2200       ******       ******        ******        ******
 2/ 3/74   2200-2400       ******       ******        ******        ******
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HOUSE  -4   FALL-WINTER  NO     AVERAGE CONCENTRATIONS , UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                        STATION
  DATE          TIME              1             1A             2               4
                              OVER STOVE  1M FROM STOVE  LIV/    RM        OUTSIDE

 2/ 4/74   0000-0200           ******         ******        ******         ******
 2/ 4/74   0200-0400           ******         ******        ******         ******
 2/ 4/74   0400-0600           ******         ******        ******         ******
 2/ 4/74   0600-0800           ******         ******        ******         ******
 2/ 4/74   0800-1000           ******         ******        ******         ******
 2/ 4/74   1000-1200           ******         ******        ******         ******
 2/ 4/74   1200-1400           ******         ******        ******         ******
 2/ 4/74   1400-1600           ******         ******        ******         ******
 2/ 4/74   1600-1800         672.7 ( 3)    626.9 ( 3)    172.6 ( 3)     32.8 ( 3)
 2/ 4/74   1800-2000         423.7 ( 6)    396.4 ( 6)    205.3 ( 6)     17.5 ( 6)
 2/ 4/74   2000-2200         334.2 ( 6)    271.9 ( 6)    162.7 ( 6)     13.1 ( 6)
 2/ 4/74   2200-2400         271.9 ( 6)    202.0 ( 6)    139.8 ( 6)     13.1 ( 6)



 2/ 5/74   0000-0200         180.2 ( 6)    124.5 ( 6)     91.7 ( 6)     12.0 ( 6)
 2/ 5/74   0200-0400         143.1 ( 6)     91.7 ( 6)     69.9 ( 6)      8.8 ( 6)
 2/ 5/74   0400-0600         122.3 ( 6)     71.0 ( 6)     53.5 ( 6)     12.0 ( 6)
 2/ 5/74   0600-0800         245.7 ( 6)    122.3 ( 6)     78.6 ( 6)     14.2 ( 6)
 2/ 5/74   0800-1000         204.2 ( 6)    145.2 ( 6)     85.2 ( 6)     18.6 ( 6)
 2/ 5/74   1000-1200         227.2 ( 3)    163.8 ( 3)    107.0 ( 3)     13.1 ( 3)
 2/ 5/74   1200-1400           ******         ******        ******         ******
 2/ 5/74   1400-1600           ******         ******        ******         ******
 2/ 5/74   1600-1800         552.6 ( 3)    463.1 ( 3)    192.2 ( 3)     19.7 ( 3)
 2/ 5/74   1800-2000         338.5 ( 6)    293.8 ( 6)    169.3 ( 6)     16.4 ( 6)
 2/ 5/74   2000-2200         258.8 ( 6)    214.0 ( 6)    128.9 ( 6)     13.1 ( 6)
 2/ 5/74   2200-2400         204.2 ( 6)    151.8 ( 6)     99.4 ( 6)     14.2 ( 6)



 2/ 6/74   0000-0200         147.4 ( 6)     97.2 ( 6)     74.2 ( 6)     13.1 ( 6)
 2/ 6/74   0200-0400         113.6 ( 6)     84.1 ( 6)     64.4 ( 6)     13.1 ( 6)
 2/ 6/74   0400-0600         114.7 ( 6)     80.8 ( 6)     59.0 ( 6)      9.8 ( 6)
 2/ 6/74   0600-0800         263.2 ( 6)    173.6 ( 6)    115.8 ( 6)     96.1 ( 6)
 2/ 6/74   0800-1000         300.3 ( 6)    259.9 ( 6)    206.4 ( 6)    136.5 ( 6)
 2/ 6/74   1000-1200         268.7 ( 1)    235.9 ( 1)    209.7 ( 1)     52.4 ( 1)
 2/ 6/74   1200-1400           ******         ******        ******         ******
 2/ 6/74   1400-1600         499.1 ( 6)    428.1 ( 6)    344.0 ( 6)     31.7 ( 6)
 2/ 6/74   1600-1800        1245.0 ( 6)   1245.0 ( 6)   1216.6 ( 6)     52.4 ( 6)
 2/ 6/74   1800-2000        1150.0 ( 6)   1143.4 ( 6)   1105.2 ( 6)     66.6 ( 6)
 2/ 6/74   2000-2200         780.8 ( 6)    753.5 ( 6)    744.8 ( 6)     39.3 ( 6)
 2/ 6/74   2200-2400         518.8 ( 6)    489.3 ( 6)    459.8 ( 6)     13.1 ( 6)
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HOUSE  -4   FALL-WINTER  NO      AVERAGE CONCENTRATIONS , UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                   STATION
   DATE        TIME              1              1A              2                4
                           OVER STOVE 1M FROM STOVE LIV/   RM      OUTSIDE

  2/ 7/74   0000-0200      340.7 ( 6)    301.4 ( 6)    286.1 ( 6)      7.7 ( 6)
  2/ 7/74   0200-0400      261.0 ( 6)    211.9 ( 6)    204.2 ( 6)      6.6 ( 6)
  2/ 7/74   0400-0600      219.5 ( 6)    168.2 ( 6)    164.3 ( 6)      6.6 ( 6)
  2/ 7/74   0600-0800      250.1 ( 6)    210.8 ( 6)    182.4 ( 6)     14.2 ( 6)
  2/ 7/74   0800-1000      263.2 ( 6)    265.4 ( 6)    212.9 ( 6)     29.5 ( 6)
  2/ 7/74   1000-1200      575.5 ( 6)    594.1 ( 6)    545.0 ( 6)     26.2 ( 6)
  2/ 7/74   1200-1400      540.6 ( 6)    489.3 ( 6)    474.0 ( 6)     26.2 ( 6)
  2/ 7/74   1400-1600      358.2 ( 6)    351.7 ( 6)    325.4 ( 6)     26.2 ( 6)
  2/ 7/74   1600-1800      798.3 ( 6)    778.7 ( 6)    664.0 ( 6)     25.1 ( 6)
  2/ 7/74   1800-2000      508.9 ( 6)    537.3 ( 6)    525.3 ( 6)     30.6 ( 6)
  2/ 7/74   2000-2200      451.0 ( 6)    389.9 ( 6)    336.4 ( 6)     13.1 ( 6)
  2/ 7/74   2200-2400      350.5 ( 6)    332.0 ( 6)    300.3 ( 6)     16.4 ( 6)

DAILY AVERAGE =            409.8         385.9         351.7           19.0
 (AVG OF 2HR VALUES)


  2/ 8/74   0000-0200      242.4 ( 6)    203.1 ( 6)    193.3 ( 6)     40.4 ( 6)
  2/ 8/74   0200-0400      197.7 ( 6)    158.4 ( 6)    148.5 ( 6)     16.4 ( 6)
  2/ 8/74   0400-0600      170.4 ( 3)    139.8 ( 3)    131.1 ( 3)     21.9 ( 3)
  2/ 8/74   0600-0800        ******        ******        ******         ******
  2/ 8/74   0800-1000        ******        ******        ******         ******
  2/ 8/74   1000-1200        ******        ******        ******         ******
  2/ 8/74   1200-1400      267.3 ( 5)    239.8 ( 5)    221.5 ( 5)     14.4 ( 5)
  2/ 8/74   1400-1600      326.5 ( 6)    303.6 ( 6)    250.1 ( 6)     27.3 ( 6)
  2/ 8/74   1600-1800      789.6 ( 6)    705.5 ( 6)    606.1 ( 6)     24.1 ( 6)
  2/ 8/74   1800-2000      476.2 ( 6)    462.0 ( 6)    431.4 ( 6)      9.8 ( 4)
  2/ 8/74   2000-2200      364.8 ( 6)    322.1 ( 6)    310.2 ( 6)     22.9 ( 2)
  2/ 8/74   2200-2400      317.8 ( 6)    274.1 ( 6)    262.1 ( 6)     15.3 ( 6)




  2/ 9/74   0000-0200      238.1 ( 6)    187.9 ( 6)    179.1 ( 6)     19.6 ( 4)
  2/ 9/74   0200-0400      192.2 ( 6)    152.9 ( 6)    143.1 ( 6)      6.6 ( 2)
  2/ 9/74   0400-0600      156.2 ( 6)    132.2 ( 6)    120.1 ( 6)     21.3 ( 4)
  2/ 9/74   0600-0800      150.7 ( 6)    132.1 ( 6)    129.9 ( 6)     64.4 ( 6)
  2/ 9/74   0800-1000      326.5 ( 6)    288.3 ( 6)    249.0 ( 6)     98.3 ( 4)
  2/ 9/74   1000-1200      250.1 ( 6)    223.9 ( 6)    172.6 ( 6)     20.8 ( 6 )
  2/ 9/74   1200-1400      186.7 ( 6)    126.7 ( 6)    114.7 ( 6)     10.4 ( 6 )
  2/ 9/74   1400-1600      156.2 ( 6)    128.9 ( 6)     95.0 ( 6)      6.7 ( 6 )
  2/ 9/74   1600-1800      191.1 ( 6)    161.6 ( 6)    135.4 ( 6)      6.3 ( 6 )
  2/ 9/74   1800-2000      229.3 ( 6)    203.1 ( 6)    182.4 ( 6)     11.1 ( 6 )
  2/ 9/74   2000-2200      219.5 ( 6)    183.5 ( 6)    170.4 ( 6)     10.0 ( 6 )
  2/ 9/74   2200-2400      393.2 ( 6)    297.0 ( 6)    233.7 ( 6)      6.1 ( 6 )

DAILY AVERAGE =            224.2         184.8         160.4           23.5
 (AVG OF 2HR VALUES)
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HOUSE  -4   FALL-WINTER  NO     AVERAGE CONCENTRATIONS , UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
      MAX.: 6 PER 2HR,72 PER DAY

                                                   STATION
  DATE          TIME             1             1A                2              4
                             OVER STOVE 1M FROM STOVE LIV      RM      OUTSIDE

 2/10/74   0000-0200      320.0 ( 6)   304.7 ( 6)   275.2 ( 6)     6.4 ( 6 )
 2/10/74   0200-0400      207.5 ( 6)   173.6 ( 6)   161.6 ( 6)    21.3 ( 6 )
 2/10/74   0400-0600      157.3 ( 6)   130.0 ( 6)   117.9 ( 6)     6.0 ( 6 )
 2/10/74   0600-0800      109.2 ( 6)   100.5 ( 6)    92.8 ( 6)    19.8 (6 )
 2/10/74   0800-1000      216.2 ( 6)   176.9 ( 6)   151.8 ( 6)    34.2 (6 )
 2/10/74   1000-1200      245.7 ( 6)   205.3 ( 6)   181.3 ( 6)    27.9 (6 )
 2/10/74   1200-1400      244.6 ( 6)   202.0 ( 6)   171.5 ( 6)    21.0 ( 6)
 2/10/74   1400-1600      246.8 ( 6)   190.0 ( 6)   172.6 ( 6)     9.1  ( 6 )
 2/10/74   1600-1800      305.8 ( 6)   254.5 ( 6)   225.0 ( 6)    10.7  ( 6 )
 2/10/74   1800-2000      275.2 ( 6)   237.0 ( 6)   211.8 ( 6)    14.8  ( 6 )
 2/10/74   2000-2200      283.9 ( 6)   234.8 ( 6)   211.9 ( 6)    16.0  ( 6 )
 2/10/74   2200-2400      217.3 ( 6)   163.8 ( 6)   155.1 ( 6)     9.5  ( 6 )

DAILY AVERAGE =           235.8        197.8        177.4         16.4
 (AVG OF 2HR VALUES)


 2/11/74   0000-0200      185.6 ( 6)   126.7 ( 6)   119.0 ( 6)     6.0 ( 6 )
 2/11/74   0200-0400      151.8 ( 6)   101.5 ( 6)    91.7 ( 6)     9.3 ( 6)
 2/11/74   0400-0600      137.6 ( 6)   108.1 ( 6)    92.8 ( 6)    13.1 ( 6)
 2/11/74   0600-0800      267.6 ( 6)   208.6 ( 6)   175.8 ( 6)    31.7 ( 6)
 2/11/74   0800-1000      405.2 ( 6)   372.4 ( 6)   309.0 ( 6)   132.1 ( 6)
 2/11/74   1000-1200      457.6 ( 6)   448.9 ( 6)   418.3 ( 6)    41.5 ( 6)
 2/11/74   1200-1400      712.1 ( 6)   618.1 ( 6)   576.6 ( 6)    13.1 ( 2)
 2/11/74   1400-1600      377.9 ( 3)   406.3 ( 3)   393.2 ( 3)
 2/11/74   1600-1800        ******       ******       ******        ******
 2/11/74   1800-2000        ******       ******       ******        ******
 2/11/74   2000-2200        ******       ******       ******        ******
 2/11/74   2200-2400        ******       ******       ******        ******




 2/13/74   0000-0200        ******       ******       ******        ******
 2/13/74   0200-0400        ******       ******       ******        ******
 2/13/74   0400-0600        ******       ******       ******        ******
 2/13/74   0600-0800        ******       ******       ******        ******
 2/13/74   0800-1000        ******       ******       ******        ******
 2/13/74   1000-1200        ******       ******       ******        ******
 2/13/74   1200-1400        ******       ******       ******        ******
 2/13/74   1400-1600      389.9 ( 4)   419.4 ( 4)   299.8 ( 4)    57.3 ( 4)
 2/13/74   1600-1800      498.0 ( 6)   441.2 ( 6)   393.1 ( 6)    59.0 ( 6)
 2/13/74   1800-2000      354.9 ( 6)   335.3 ( 6)   303.6 ( 6)    49.1 ( 6)
 2/13/74   2000-2200      441.2 ( 6)   439.0 ( 6)   407.3 ( 6)    72.0 ( 6)
 2/13/74   2200-2400      411.7 ( 6)   391.0 ( 6)   369.1 ( 6)    83.0 ( 6)
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HOUSE  -4   FALL-WINTER  NO     AVERAGE CONCENTRATIONS , UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                   STATION
  DATE          TIME           1             1A            2               4
                          OVER STOVE 1M FROM STOVE LIV/    RM       OUTSIDE

 2/14/74   0000-0200      317.8 ( 6)   300.3 ( 6)   286.1 ( 6)    69.9 ( 6)
 2/14/74   0200-0400      277.4 ( 6)   241.3 ( 6)   233.7 ( 6)    54.6 ( 6)
 2/14/74   0400-0600      243.5 ( 6)   206.4 ( 6)   193.3 ( 6)    18.6 ( 6)
 2/14/74   0600-0800      375.7 ( 6)   280.7 ( 6)   228.2 ( 6)     7.7 ( 6)
 2/14/74   0800-1000      263.2 ( 6)   277.4 ( 6)   204.2 ( 6)    13.1 ( 6)
 2/14/74   1000-1200      270.8 ( 6)   208.6 ( 6)   175.8 ( 6)    13.1 ( 6)
 2/14/74   1200-1400      231.5 ( 6)   194.4 ( 6)   192.2 ( 6)     7.7 ( 6)
 2/14/74   1400-1600      836.5 ( 6)   678.8 ( 5)   591.9 ( 6)    12.0 ( 6)
 2/14/74   1600-1800      819.1 ( 5)   795.5 ( 5)   775.8 ( 5)    14.2 ( 6)
 2/14/74   1800-2000      522.0 ( 6)   522.0 ( 6)   486.0 ( 6)    13.1 ( 6)
 2/14/74   2000-2200      397.5 ( 6)   310.2 ( 6)   308.0 ( 6)    13.1 ( 6)
 2/14/74   2200-2400      249.0 ( 6)   206.4 ( 6)   197.7 ( 6)    13.1 ( 6)

DAILY AVERAGE =           400.3        351.8        322.8         20.8
 (AVG OF 2HR VALUES)


 2/15/74   0000-0200      190.0 ( 6)   139.8 ( 6)   131.1 ( 6)     9.8 ( 6)
 2/15/74   0200-0400      160.6 ( 6)   114.7 ( 6)   103.7 ( 6)     7.7 ( 6)
 2/15/74   0400-0600      199.9 ( 6)   135.4 ( 6)   102.6 ( 6)     8.8 ( 6)
 2/15/74   0600-0800      221.7 ( 6)   185.6 ( 6)   161.6 ( 6)     8.8 ( 6)
 2/15/74   0800-1000      234.8 ( 6)   240.2 ( 6)   167.1 ( 6)    13.1 ( 6)
 2/15/74   1000-1200      256.6 ( 6)   213.0 ( 6)   167.1 ( 6)    14.2 ( 6)
 2/15/74   1200-1400      208.0 ( 4)   175.3 ( 4)   172.0 ( 4)    13.1 ( 4)
 2/15/74   1400-1600        ******       ******       ******        ******
 2/15/74   1600-1800        ******       ******       ******        ******
 2/15/74   1800-2000        ******       ******       ******        ******
 2/15/74   2000-2200        ******       ******       ******        ******
 2/15/74   2200-2400        ******       ******       ******        ******
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HOUSE   4   FALL-WINTER  CO AVERAGE CONCENTRATIONS , UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                    STATION
   DATE        TIME            1            1A             2                4
                          OVER STOVE 1M FROM STOVE LIV/    RM      OUTSIDE

  1/30/74   0000-0200        ******         ******         ******         ******
  1/30/74   0200-0400        ******         ******         ******         ******
  1/30/74   0400-0600        ******         ******         ******         ******
  1/30/74   0600-0800        ******         ******         ******         ******
  1/30/74   0800-1000        ******         ******         ******         ******
  1/30/74   1000-1200        ******         ******         ******         ******
  1/30/74   1200-1400        ******         ******         ******         ******
  1/30/74   1400-1600     11268. ( 5) 10751. ( 5) 10344. ( 5)  1145. ( 5)
  1/30/74   1600-1800     17051. ( 6) 16436. ( 6) 13449. ( 6)  2089. ( 6)
  1/30/74   1800-2000      9991. ( 6) 11469. ( 6)  8667. ( 6)  2140. ( 6)
  1/30/74   2000-2200     12842. ( 6) 13058. ( 6) 12349. ( 6)  3329. ( 6)
  1/30/74   2200-2400     14377. ( 5) 14377. ( 5) 13262. ( 5)  2871. ( 5)




  1/31/74   0000-0200     13308. ( 6) 13308. ( 6) 12140. ( 6)  2162. ( 6)
  1/31/74   0200-0400      9216. ( 6)  8887. ( 6)  8468. ( 6)  1666. ( 6)
  1/31/74   0400-0600      6597. ( 6)  6298. ( 6)  5788. ( 6)  1564. ( 6)
  1/31/74   0600-0800      8603. ( 5)  8127. ( 5)  7578. ( 5)  3149. ( 5)
  1/31/74   0800-1000      8819. ( 6)  8118. ( 6)  7690. ( 6)  2931. ( 6)
  1/31/74   1000-1200      6442. ( 6)  6198. ( 6)  5618. ( 6)  2751. ( 6)
  1/31/74   1200-1400      6477. ( 6)  7301. ( 6)  5959. ( 6)  2084. ( 6)
  1/31/74   1400-1600      7260. ( 5)  6817. ( 5)  6374. ( 5)  2605. ( 5)
  1/31/74   1600-1800     11747. ( 6) 12178. ( 6) 11378. ( 6)  3034. ( 6)
  1/31/74   1800-2000      9617. ( 6)  9832. ( 6)  8354. ( 6)  2751. ( 6)
  1/31/74   2000-2200      9256. ( 6)  9256. ( 6)  7871. ( 6)  1652. ( 6)
  1/31/74   2200-2400      6443. ( 5)  6077. ( 5)  5491. ( 5)  2380. ( 5)

DAILY AVERAGE =            8649.        8533.        7726.        2394.
 (AVG OF 2HR VALUES)


  2/ 1/74   0000-0200      5183. ( 6)  4512. ( 6)  4146. ( 6)  2467. ( 6)
  2/ 1/74   0200-0400      4394. ( 6)  3998. ( 6)  3632. ( 6)  2198. ( 6)
  2/ 1/74   0400-0600      4291. ( 6)  3558. ( 6)  3375. ( 6)  2094. ( 6)
  2/ 1/74   0600-0800      5175. ( 5)  4662. ( 5)  4370. ( 5)  2429. ( 5)
  2/ 1/74   0800-1000      6131. ( 6)  6649. ( 6)  4880. ( 6)  1799. ( 6)
  2/ 1/74   1000-1200     11083. ( 6) 11388. ( 6)  9679. ( 6)  3053. ( 5)
  2/ 1/74   1200-1400     11149. ( 6) 10752. ( 6)  9257. ( 6)  2180. ( 6)
  2/ 1/74   1400-1600      9079. ( 5)  9445. ( 5)  7798. ( 5)  1903. ( 5)
  2/ 1/74   1600-1800     15901. ( 6) 15321. ( 6) 14863. ( 6)  2020. ( 6)
  2/ 1/74   1800-2000     13739. ( 6) 12855. ( 6) 12214. ( 6)   591. ( 6)
  2/ 1/74   2000-2200     13004. ( 6) 12820. ( 6) 11753. ( 6)   953. ( 6)
  2/ 1/74   2200-2400     10619. ( 5) 10766. ( 5) 10217. ( 5)  2456. ( 5)

DAILY AVERAGE =            9146.        8894.        8015.        2012.
 (AVG OF 2HR VALUES)
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HOUSE   4   FALL-WINTER  CO AVERAGE CONCENTRATIONS , UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                     STATION
   DATE          TIME            1               1A              2                4
                            OVER STOVE  1M FROM STOVE  LIV/BD RM          OUTSIDE

  2/ 2/74    0000-0200       7348. ( 9)   7737. ( 9)   7001. ( 9)    2315. ( 9)
  2/ 2/74    0200-0400       5640. ( 6)   6006. ( 6)   5396. ( 6)    1766. ( 6)
  2/ 2/74    0400-0600       4783. ( 6)   5362. ( 6)   4630. ( 6)    1640. ( 6)
  2/ 2/74    0600-0800       5158. ( 3)   5841. ( 3)   5158. ( 3)    2672. ( 3)
  2/ 2/74    0800-1000       8598. ( 6)   8971. ( 6)   7324. ( 6)    2527. ( 6)
  2/ 2/74    1000-1200       7507. ( 6)   7848. ( 6)   7631. ( 6)    2534. ( 5)
  2/ 2/74    1200-1400      10703. ( 6)  11635. ( 6)   9584. ( 6)    3438. ( 5)
  2/ 2/74    1400-1600      10433. ( 3)  11653. ( 3)  11105. ( 3)    2929. ( 3)
  2/ 2/74    1600-1800      10903. ( 6)  10683. ( 6)   9987. ( 6)    2636. ( 5)
  2/ 2/74    1800-2000      10930. ( 6)  11235. ( 6)  10443. ( 6)    2907. ( 6)
  2/ 2/74    2000-2200       8658. ( 6)   8994. ( 6)   8567. ( 6)    2528. ( 5)
  2/ 2/74    2200-2400      15660. ( 1)  14542. ( 1)  14542. ( 1)    2051. ( 1)

DAILY AVERAGE =              8860.        9209.        8447.         2495.
 (AVG OF 2HR VALUES)


  2/ 3/74    0000-0200       8585. ( 6)   8740. ( 6)   8274. ( 6)    1687. ( 6)
  2/ 3/74    0200-0400       5650. ( 6)   6303. ( 6)   5433. ( 6)    1518. ( 6)
  2/ 3/74    0400-0600       5361. ( 6)   5454. ( 6)   4616. ( 6)    1726. ( 6)
  2/ 3/74    0600-0800       4050. ( 5)   4752. ( 5)   3939. ( 5)    1760. ( 5)
  2/ 3/74    0800-1000       3440. ( 5)   4031. ( 5)   3440. ( 5)    1666. ( 5)
  2/ 3/74    1000-1200         ******       ******       ******        ******
  2/ 3/74    1200-1400         ******       ******       ******        ******
  2/ 3/74    1400-1600         ******       ******       ******        ******
  2/ 3/74    1600-1800         ******       ******       ******        ******
  2/ 3/74    1800-2000         ******       ******       ******        ******
  2/ 3/74    2000-2200         ******       ******       ******        ******
  2/ 3/74    2200-2400       9947. ( 5)  10132. ( 5)   9836. ( 5)    2115. ( 5)



  2/ 4/74    0000-0200       6826. ( 6)   7134. ( 6)   6611. ( 6)    1746. ( 6)
  2/ 4/74    0200-0400       5136. ( 6)   5752. ( 6)   4951. ( 6)    1657. ( 6)
  2/ 4/74    0400-0600       4116. ( 6)   4916. ( 6)   3993. ( 6)    1468. ( 6)
  2/ 4/74    0600-0800       6170. ( 5)   6539. ( 5)   5135. ( 5)    2632. ( 4)
  2/ 4/74    0800-1000       9951. ( 4)  13091. ( 4)   9074. ( 4)    2470. ( 4)
  2/ 4/74    1000-1200      10635. ( 6)  10481. ( 6)  10019. ( 6)    2384. ( 6)
  2/ 4/74    1200-1400       8332. ( 6)   8302. ( 6)   8363. ( 6)    2329. ( 6)
  2/ 4/74    1400-1600       7350. ( 5)   7716. ( 5)   7460. ( 5)    2627. ( 5)
  2/ 4/74    1600-1800      16735. ( 6)  18108. ( 6)  15576. ( 6)    3251. ( 6)
  2/ 4/74    1800-2000      12282. ( 6)  12160. ( 6)  11764. ( 6)    2093. ( 6)
  2/ 4/74    2000-2200      10277. ( 6)  10216. ( 6)   9850. ( 6)    1949. ( 6)
  2/ 4/74    2200-2400       8608. ( 5)   9162. ( 5)   8349. ( 5)    2993. ( 5)

DAILY AVERAGE =              8868.        9465.        8429.         2300.
 (AVG OF 2HR VALUES)
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HOUSE    4    FALL-WINTER  CO AVERAGE CONCENTRATIONS , UG/M3
  VALUES IN ( ) ARE NO. OF OBSERVATIONS IN PERIOD
     MAX.: 6 PER 2HR,72 PER DAY

                                                  STATION
 DATE          TIME             1             1A              2               4
                            OVER STOVE 1M FROM STOVE LIV/    RM      OUTSIDE

 2/ 5/74   0000-0200       5962. ( 6)   6454. ( 6)   5715. ( 6)   3006. ( 6)
 2/ 5/74   0200-0400       4411. ( 5)   4842. ( 6)   4781. ( 6)   1918. ( 6)
 2/ 5/74   0400-0600       3065. ( 6)   3435. ( 6)   2881. ( 6)   1403. ( 6)
 2/ 5/74   0600-0800       8386. ( 5)   9051. ( 5)   7721. ( 5)   4396. ( 5)
 2/ 5/74   0800-1000      11391. ( 6)  11668. ( 6)   9852. ( 6)   4988. ( 6)
 2/ 5/74   1000-1200      14840. ( 6)  14347. ( 6)  12253. ( 6)   4557. ( 6)
 2/ 5/74   1200-1400      15856. ( 6)  15578. ( 6)  13639. ( 6)   4125. ( 6)
 2/ 5/74   1400-1600      11752. ( 5)  11935. ( 5)  11861. ( 5)   4905. ( 5)
 2/ 5/74   1600-1800      16612. ( 6)  16246. ( 6)  14385. ( 6)   5568. ( 6)
 2/ 5/74   1800-2000      14618. ( 6)  13276. ( 6)  12086. ( 6)   4245. ( 6)
 2/ 5/74   2000-2200      12098. ( 6)  12130. ( 6)  11824. ( 6)   4441. ( 6)
 2/ 5/74   2200-2400      11125. ( 5)  11850. ( 5)  10435. ( 5)   5284. ( 5)

DAILY AVERAGE =           10843.       10906.        9786.        4070.
 (AVG OF 2HR VALUES)


 2/ 6/74   0000-0200       8413. ( 6)   8927. ( 6)   8141. ( 6)   5088. ( 6)
 2/ 6/74   0200-0400       7001. ( 6)   7364. ( 6)   6819. ( 6)   4491. ( 6)
 2/ 6/74   0400-0600       6476. ( 6)   6718. ( 6)   6264. ( 6)   4478. ( 5)
 2/ 6/74   0600-0800         ******       ******       ******       ******
 2/ 6/74   0800-1000         ******       ******       ******       ******
 2/ 6/74   1000-1200         ******       ******       ******       ******
 2/ 6/74   1200-1400         ******       ******       ******       ******
 2/ 6/74   1400-1600      12245. ( 5)  13930. ( 5)  10643. ( 5)    925. ( 4)
 2/ 6/74   1600-1800      21806. ( 6)  21669. ( 6)  21361. ( 6)   1431. ( 6)
 2/ 6/74   1800-2000      18734. ( 6)  19453. ( 6)  17980. ( 6)   1256. ( 5)
 2/ 6/74   2000-2200      15139. ( 6)  14352. ( 6)  14483. ( 6)    929. ( 5)
 2/ 6/74   2200-2400      12484. ( 5)  11678. ( 5)  10873. ( 5)    282. ( 5)
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HØUSE   4   FALL-WINTER  CØ AVERAGE CØNCENTRATIØNS , UG/M3
  VALUES IN ( ) ARE NØ. ØF ØBSERVATIØNS IN PERIØD
     MAX.: 6 PER 2HR,72 PER DAY

                                                  STATIØN
 DATE          TIME             1            1A              2            4
                            ØVER STØVE 1M FRØM STØVE LIV/   RM      ØUTSIDE


2/13/74   0000-0200          ******        ******        ******        ******
2/13/74   0200-0400          ******        ******        ******        ******
2/13/74   0400-0600          ******        ******        ******        ******
2/13/74   0600-0800          ******        ******        ******        ******
2/13/74   0800-1000          ******        ******        ******        ******
2/13/74   1000-1200          ******        ******        ******        ******
2/13/74   1200-1400          ******        ******        ******        ******
2/13/74   1400-1600      12345. ( 5) 12986. ( 5) 10469. ( 5)  3285. ( 5)
2/13/74   1600-1800      14246. ( 6) 13368. ( 6) 12606. ( 6)  4025. ( 6)
2/13/74   1800-2000      12093. ( 6) 11712. ( 6) 10530. ( 6)  3055. ( 6)
2/13/74   2000-2200      13038. ( 6) 12886. ( 6) 12466. ( 6)  2475. ( 6)
2/13/74   2200-2400      11410. ( 5) 11141. ( 5) 10515. ( 5)  2685. ( 5)




2/14/74   0000-0200       8073. ( 6)  7737. ( 6)  7290. ( 6)  1995. ( 6)
2/14/74   0200-0400       6078. ( 6)  5668. ( 6)  5332. ( 6)  1007. ( 6)
2/14/74   0400-0600       4885. ( 6)  4362. ( 6)  4139. ( 6)   783. ( 2)
2/14/74   0600-0800      10248. ( 5)  8145. ( 5)  7206. ( 5)  1960. ( 4)
2/14/74   0800-1000      10247. ( 6) 10695. ( 6)  8718. ( 6)  1634. ( 6)
2/14/74   1000-1200       8469. ( 6)  6642. ( 6)  5672. ( 6)  1309. ( 3)
2/14/74   1200-1400       5413. ( 6)  5189. ( 6)  5338. ( 6)   398. ( 4)
2/14/74   1400-1600      14497. ( 5) 10873. ( 5) 10112. ( 5)   890. ( 6 )
2/14/74   1600-1800      14142. ( 6) 13173. ( 6) 13732. ( 6)  1330. ( 6 )
2/14/74   1800-2000      11015. ( 6)  9375. ( 6)  8181. ( 6)   550. ( 6 )
2/14/74   2000-2200       6248. ( 6)  5688. ( 6)  5838. ( 6)   400. ( 6 )
2/14/74   2200-2400       5209. ( 5)  4683. ( 5)  4596. ( 5)  2060. ( 6 )

DAILY AVERAGE =           8710.        7686.        7179.        1193.
 (AVG ØF 2HR VALUES)



2/15/74   0000-0200       3191. ( 6)  2644. ( 6)  2498. ( 6)  1840. ( 6 )
2/15/74   0200-0400       1767. ( 6)  1329. ( 6)  1147. ( 6)  1230. ( 6 )
2/15/74   0400-0600       1701. ( 6)  1008. ( 6)   753. ( 6)  1620. ( 6 )
2/15/74   0600-0800       5865. ( 5)  5515. ( 5)  4727. ( 5)  2100. ( 5 )
2/15/74   0800-1000       9557. ( 6) 10688. ( 6)  8718. ( 6)  1860. ( 6 )
2/15/74   1000-1200      10615. ( 6)  9338. ( 6)  8493. ( 6)  1880. ( 6 )
2/15/74   1200-1400       7733. ( 3)  7295. ( 3)  7295. ( 3)  1640. ( 6 )
2/15/74   1400-1600          ******        ******        ******        ******
2/15/74   1600-1800          ******        ******        ******        ******
2/15/74   1800-2000          ******        ******        ******        ******
2/15/74   2000-2200          ******        ******        ******        ******
2/15/74   2200-2400          ******        ******        ******        ******
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